MAY, 1955

To L.C.

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

Standardization of Chromium Bath Tests on a Bent Cathode in the Hull Cell
A New Method for Evaluating Covering Power

Spotting-out and Staining on Plated Work
A Simple Test for Stain-Producing Conditions in the Plating Cycle

Complex Ions in Chromium Plating Solutions
Preliminary Study of Complex Chromium Ions Using Ion Exchange

Plating Bath Control: Past, Present and Future
Achieving the Goal of Minimum Maintenance by Automatic Control

Electropolishing "Nimonic 80"
Determination of Suitable Solution and Operating Conditions for High Nickel-Chromium Alloys

Finishing Pointers
Determination of Oil in a Vapor Degreaser

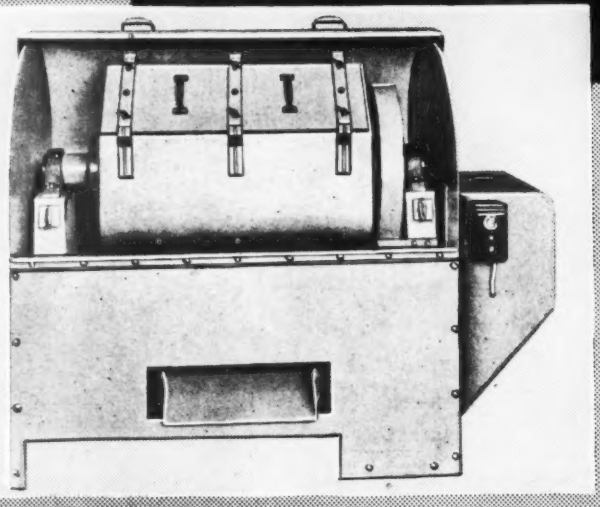
Science for Electroplaters
Within the Atom

Complete Contents Page 47

WHERE PLATERS AND FINISHERS LOOK FOR INFORMATION
WESTWOOD, N. J.
FINISHING PUBLICATIONS, INC.

READ & PASS ON

If You are BARREL DEBURRING *You need* CLEPO COMPOUNDS



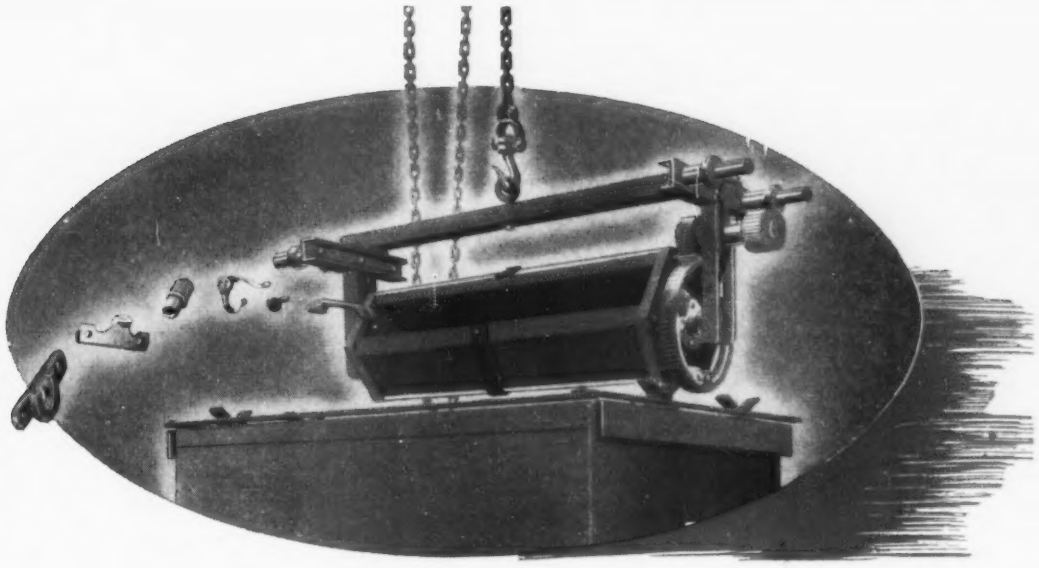
The makers of Clepo Barrel Compounds have been pioneers in the barrel finishing field for over 20 years.
Our Field Engineers and Pilot Plant are available to handle all your problems without cost to you.
Why not avail yourself of our know-how and facilities.
Clepo Compounds cover the entire range of cutting type materials.

CUTTING TYPE MATERIALS	CLEPO 19-D	Coarse cutting of Steel.
	CLEPO 212-F	Fast heavy deburring of all Metals.
	CLEPO 15-W	Mild cutting on non ferrous Metals.
	CLEPO 171-A	Polishing hardened Steel.
NONE CUTTING TYPES	"using abrasive media or shine rolling with any media"	
	CLEPO 202-S	Steel, Brass, Aluminum, Etc.
	CLEPO 164-Z	Zinc base castings.
	CLEPO 165-B	Stainless Steel.
DESCALING	Also the following Clepo materials for descaling.	
	CLEPO 194-S and CLEPO 191-D	

For more information on these and other Clepo materials consult your Clepo Service man or write for Clepo tumbling manual.

CLEPO — CLEANING COMPOUNDS

FREDERICK GUMM
Chemical Company Inc.
538 FOREST STREET, KEARNY, N.J.



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Hundreds of manufacturers throughout the United States are now using electroplated aluminum. The Alumon process is simple. The work is merely cleaned, dipped in acid, dipped in Alumon and is then ready for electroplating with copper, nickel, and other metals. The process is suitable for plating most wrought and cast alloys. . . The cost of using Alumon is low, being less than half a cent per square foot of surface area treated. The process can be fitted easily into regular plating cycles. Bulk or barrel plating readily done. Upon request we'll gladly send you the Alumon Process Bulletin.

Write for literature on Alumon and check list of literature on sixty Enthone products and processes for better metal finishing.

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442 ELM STREET
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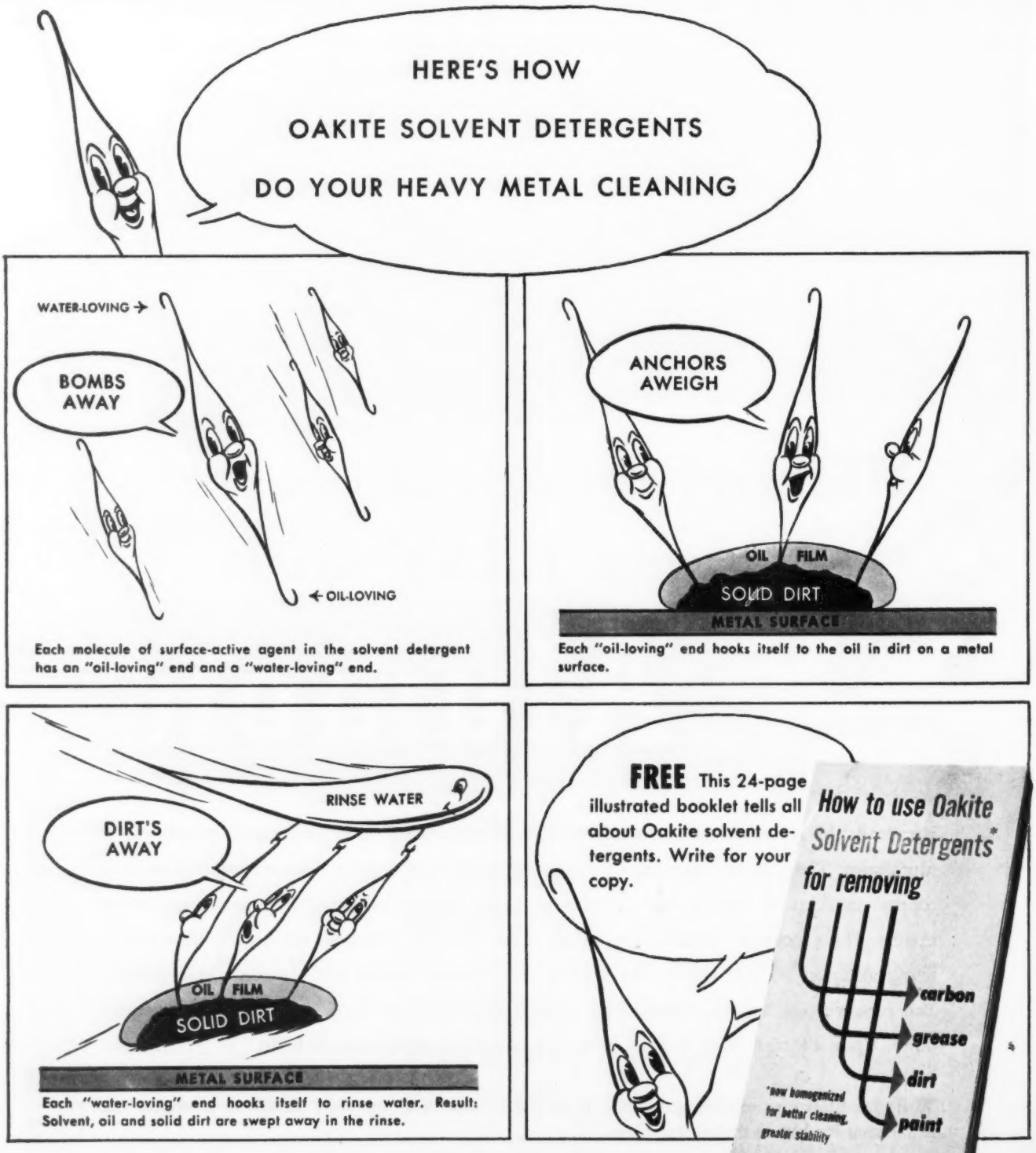
ELECTROPLATING CHEMICALS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OAKITE SOLVENT DETERGENTS
DO YOUR HEAVY METAL CLEANING
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BOMBS AWAY
OIL-LOVING
Each molecule of surface-active agent in the solvent detergent has an "oil-loving" end and a "water-loving" end.
ANCHORS AWEIGH
OIL FILM
SOLID DIRT
METAL SURFACE
Each "oil-loving" end hooks itself to the oil in dirt on a metal surface.
RINSE WATER
DIRT'S AWAY
OIL FILM
SOLID DIRT
METAL SURFACE
Each "water-loving" end hooks itself to rinse water. Result: Solvent, oil and solid dirt are swept away in the rinse.
FREE This 24-page illustrated booklet tells all about Oakite solvent detergents. Write for your copy.
How to use Oakite Solvent Detergents* for removing
carbon
grease
dirt
paint
*now homogenized for better cleaning, greater stability
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Oakite solvent detergents make it easy for you to remove heavy soils such as drawing and buffing compounds and thick deposits of other oils and greases.

Oakite solvent detergents may be used in spray washing machines or in tanks. They offer many advantages: speedy removal of stubborn soils, safety for all metals, economy, reduction of fire hazards, protection against rusting.

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MATERIALS • METHODS • SERVICE

Metal Finishing is published monthly by the Finishing Publications, Inc., 381 Broadway, Westwood, New Jersey, U.S.A. Entered as second class matter at the Post Office in Westwood, N. J. Volume 53, No. 5, May, 1955. Four Dollars Per Year.

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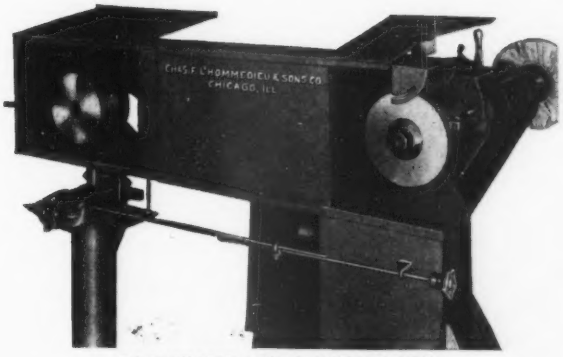
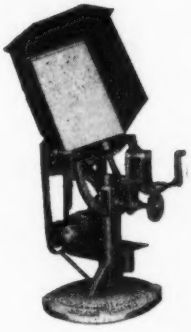
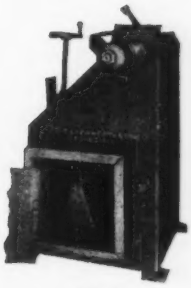


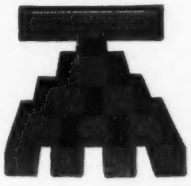
BACKSTAND IDLER WITH LATHE



OBLIQUE
TUMBLING BARREL



#23A
POLISHING LATHE



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STANDARD SIZE
2 x 2 x 10"

NUWAY BUFFS FOR
FAST CUTTING

BACKSTAND IDLER

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WAGNER BROTHERS PLATING AUTOMATION

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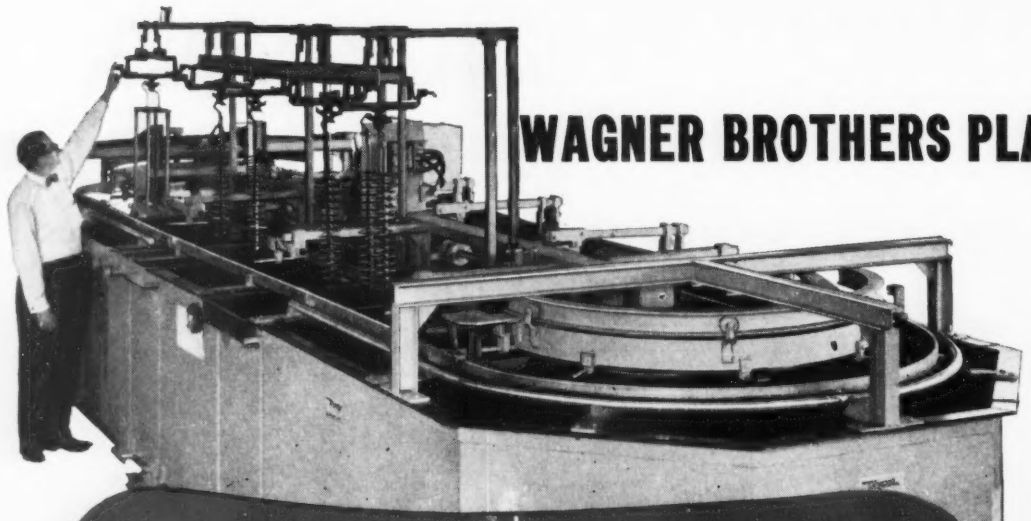
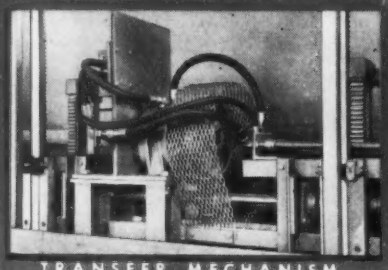
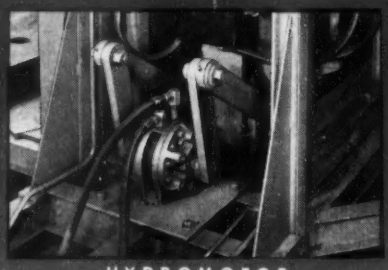
Smooth power

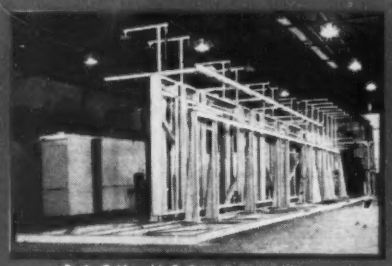




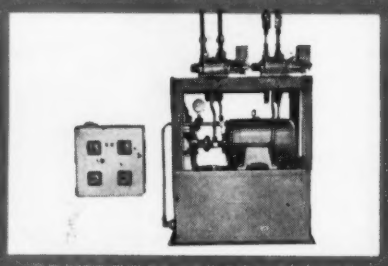
TRANSFER MECHANISM



HYDROMOTOR



RACK MECHANISM



CONTROL PANEL POWER UNIT

SMOOTH OPERATION SAVES YOU TIME

The new Wagner Brothers Automatic Plating Machine operates so smoothly that you can balance a full water glass on the transfer mechanism throughout the entire plating cycle. Obviously such smooth operation will save you time now spent salvaging parts from tanks, dropped there because of the jolting transfer action of ordinary plating machines. This smooth, positive performance is accomplished by our Hydromotor power principle which makes each start and stop as gentle as a breeze.

LOW POWER REQUIREMENTS SAVE YOU MONEY

Powered by one 5 hp electric motor, the installation shown uses less than half the power required by any comparative automatic plater. This is made possible because no superstructure is being lifted along with the work load.

FLEXIBLE CONTROLS SIMPLIFY OPERATION

Two sets of controls, both hydraulic and electric, regulate production and cycle time. Drag-out or dwell time are easily varied with this unit. If you desire extremely long drag-out or dwell times, the machine can be modified with a two shaft arrangement.

OTHER PLUS FEATURES

Light components make for economical installation. This compact unit needs a minimum of floor space, and a model using 48-inch racks can be operated under a 12-foot ceiling. All driving and actuating parts are easily accessible for adjustment. There are no greased parts or hydraulic fittings over tanks. Central lubrication. Automatic heat control. Triple contacts on cathode bars. And so many other outstanding features that our engineers would be pleased to explain to you.

Write or wire for complete information about this revolutionary advance in plating automation.

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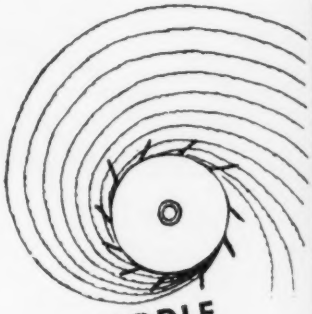

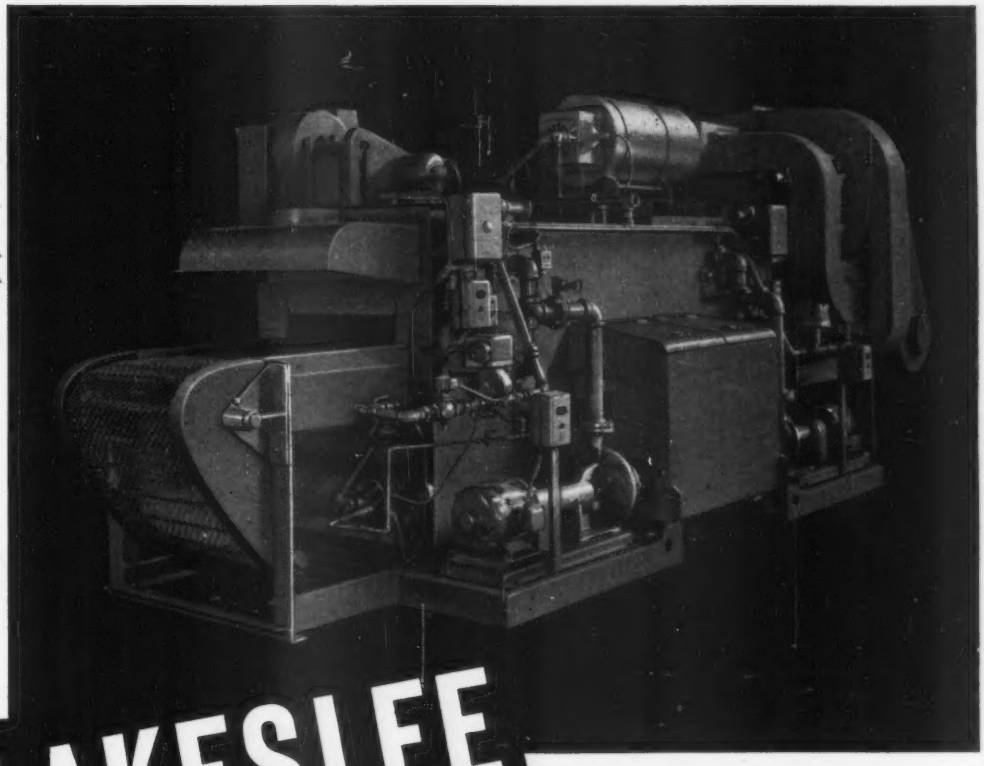

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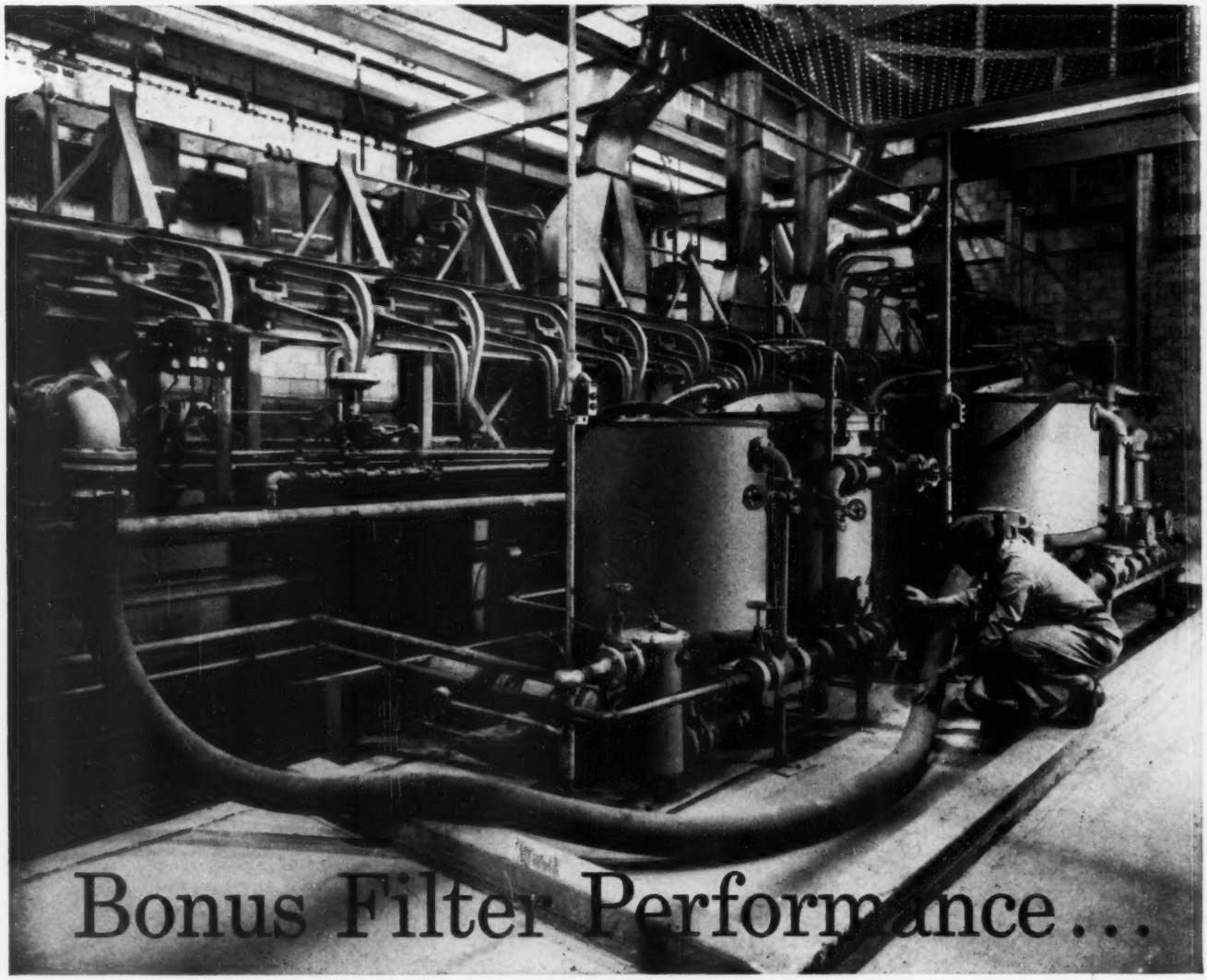

On Nickel Dip and Neutralizer Solutions at New Westinghouse Appliance Plant, Columbus, Ohio

A view of the two INDUSTRIAL filters—one on the nickel dip solution and one on the neutralizer solution. Each is a complete unit with primer-strainer tank, precoat slurry tank, filter, pumping unit, and all valves for filtration, addition of filter aids, free pumping, and filter drainage. Each filter is furnished with INDUSTRIAL air-wash manifold for cleaning filter.

Adequate turnover in the continuous filtration of the nickel dip and neutralizer solutions by the INDUSTRIAL filters assures dependable clarity. Furthermore, the air-wash cleaning feature eliminates the opening or dismantling of the filter for cleaning. The removal of the cover is necessary only for replacing the filter cloths or for periodic inspection—a great time and labor saver. It is this overall bonus performance that accounts for the universal use of INDUSTRIAL filters with the vitreous enameling processes.

Full Particulars and Recommendations for Any Job on Request

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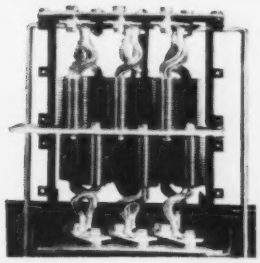
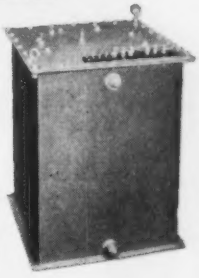
RUBBER LININGS
HEAT EXCHANGERS
CORROSION TEST CABINETS
CENTRIFUGAL PUMPS



Hermetically Sealed Germanium Junctions



Oil Immersed, Motorized Continuously-Variable Inductor Control

THE *NEWEST* AND THE *ULTIMATE* IN PLATING POWER

In keeping with our policy of continually supplying the plating industry with the ultimate in D.C. Plating Power, our research department has developed a series of GERMANIUM RECTIFIERS — what we believe to be the ultimate in Plating Power.

EFFICIENCY — 95% at full load.

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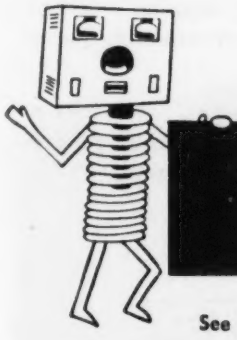

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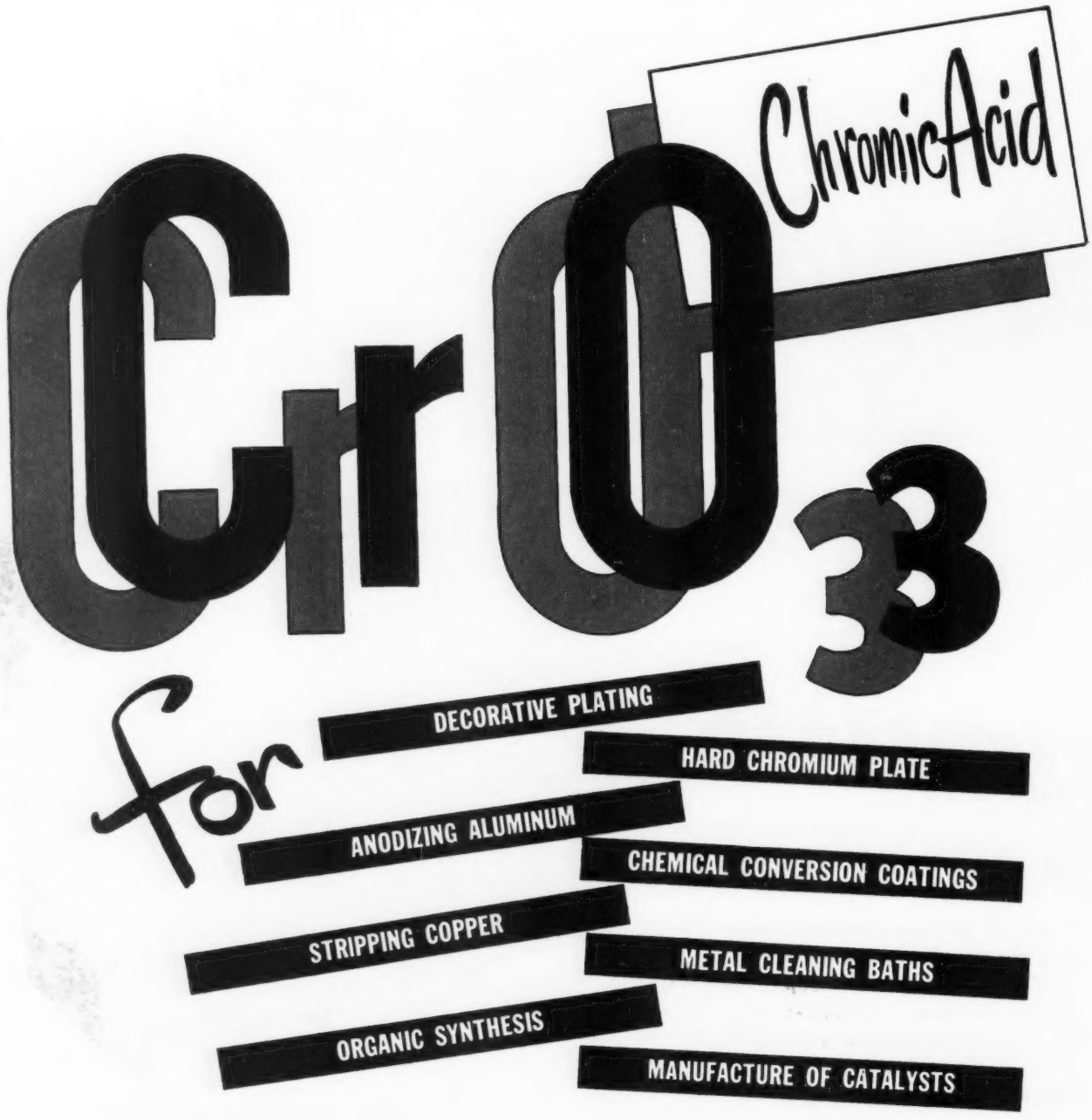

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IN RECOGNITION of its contribution to and membership on a production team responsible for an achievement unparalleled in industrial history—the building by General Motors in the United States of fifty million motor vehicles.
ON THE OCCASION of the production at the Chevrolet Assembly Plant at Flint, Michigan, this Twenty-third of November, Nineteen Hundred Fifty-four, of GM Vehicle No. 50,000,000.
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GENERAL MOTORS
50
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*We make no reference to the shape at left.

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AUTOMATIC MACHINES FOR BUFFING • POLISHING • DEBURRING

THE PACKER MACHINE CO.

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McGean Bright Nickel

Use a bright nickel solution
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infrequent need
for purification . . .

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brighter deposits
superior bright throwing power

WITH THESE FEATURES . . .

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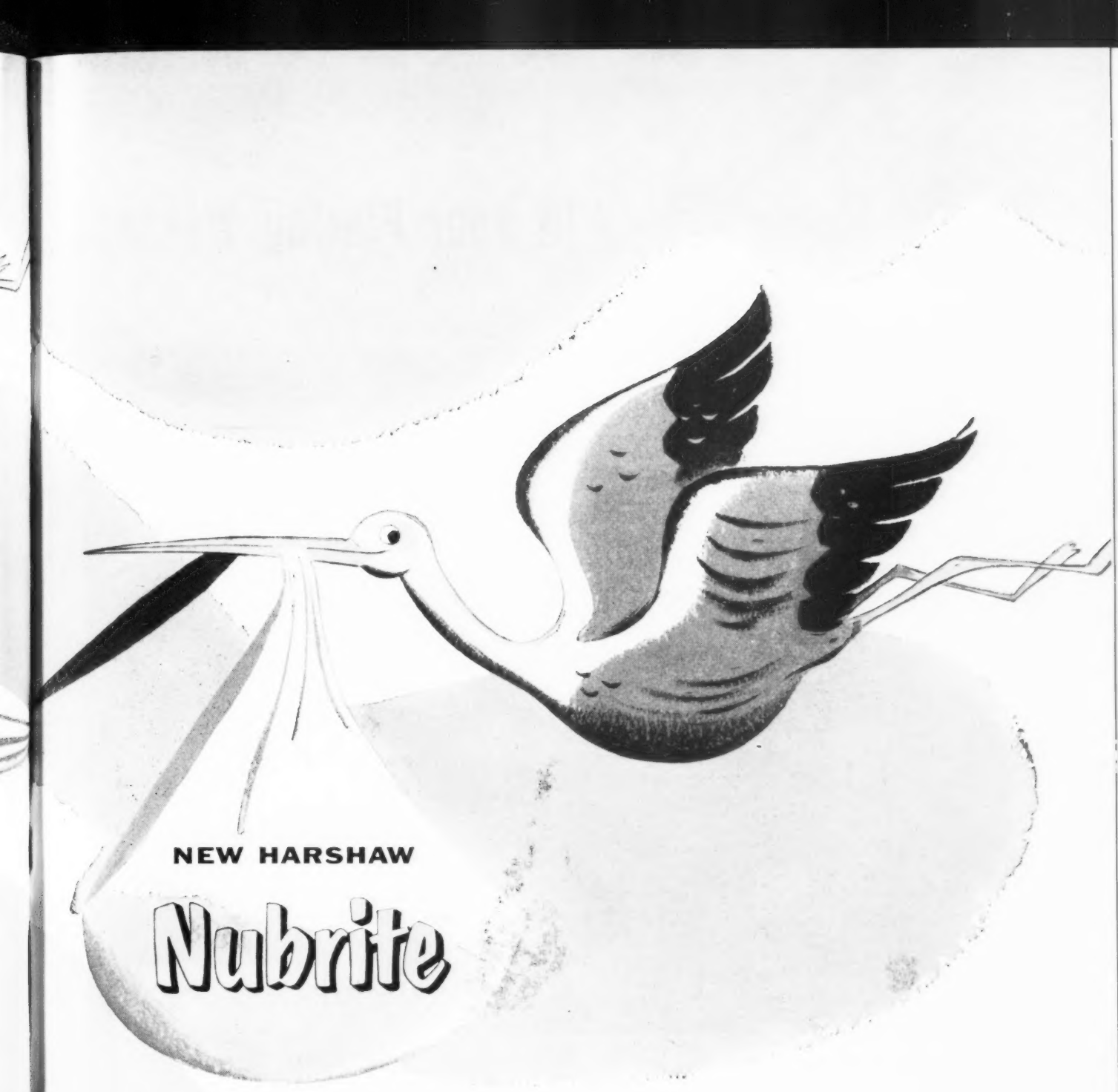
McGEAN

***Each* of these new outstanding Harshaw bright nickel plating processes has certain unusual characteristics which fit it to the product finish required in your plant.**

Top brightness with thin deposits . . . Especially outstanding color performance in applications where little or no basis metal finishing is done prior to plating. . . . Perglow or Nubrite deposits are extremely receptive to chrome plating . . . Unique leveling results of Perglow or Nubrite have a hiding and filling effect on surface defects which other nickel deposits tend to emphasize. Polishing costs are decreased.

For application in your plant, phone or write our nearest office.



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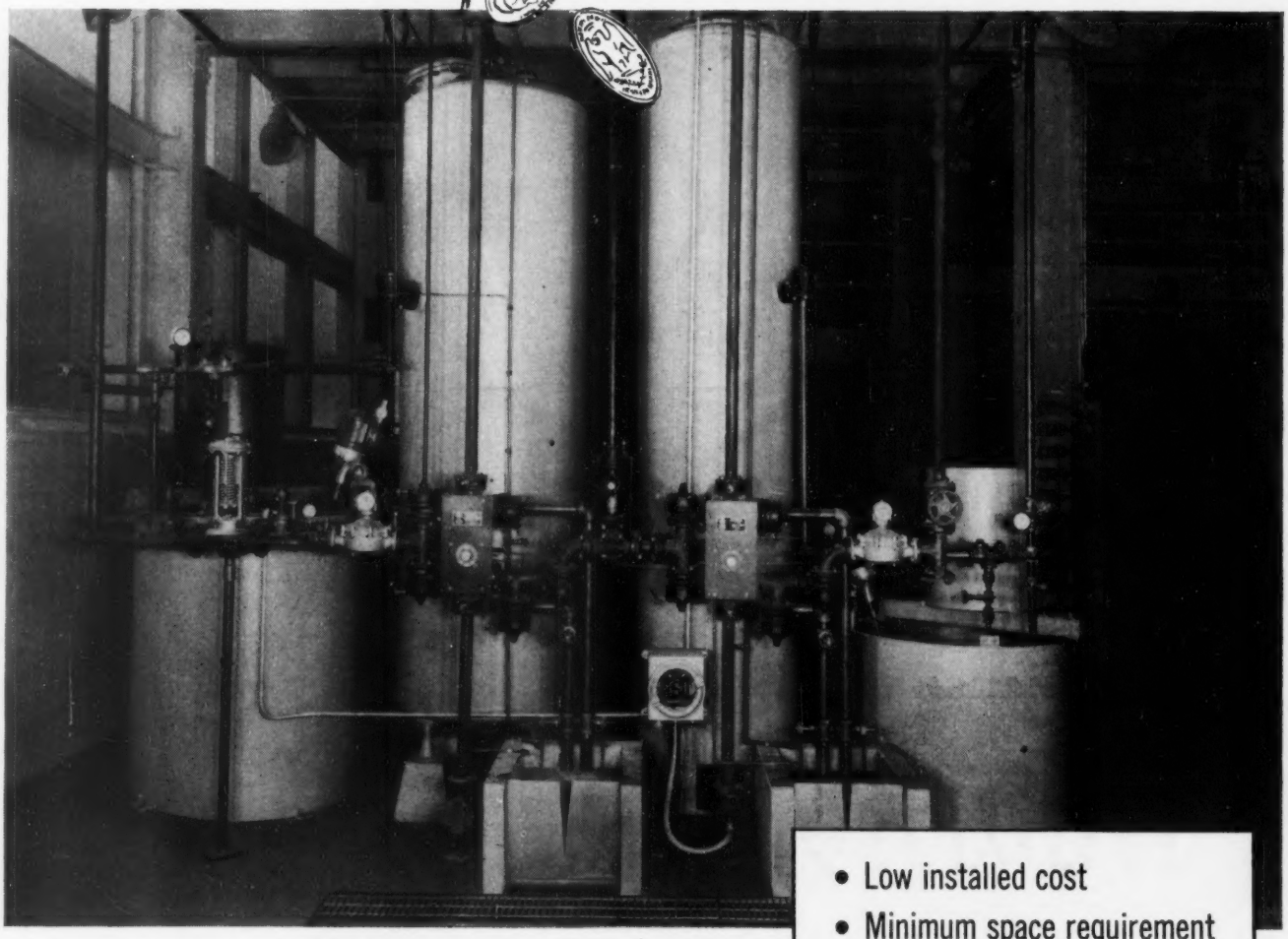

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- Low installed cost
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- Demineralized rinse water
- Simplified waste disposal

New ion exchange techniques using "CATEXER" "ANEXER" plants make it practical to recover valuable chemicals and rinse waters in some cases. Only careful evaluation will show whether recovery methods, or treatment by oxidation, reduction or precipitation is more economical. INFILCO manufactures all types of waste treatment equipment and can offer impartial evaluation of your problem. Write for complete information.

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4. NON-METALLIC CENTER — (No Shaft Scoring)
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for AUTOMATIC BUFFING

High-speed automatic buffing needs very hard and stable compounds to operate efficiently — hard to withstand tough usage . . . stable to withstand extreme heat. Now Apothecaries Hall Company has formulated a new series of high speed buffing bars that always adhere to the wheel, never lose their abrasive quality.

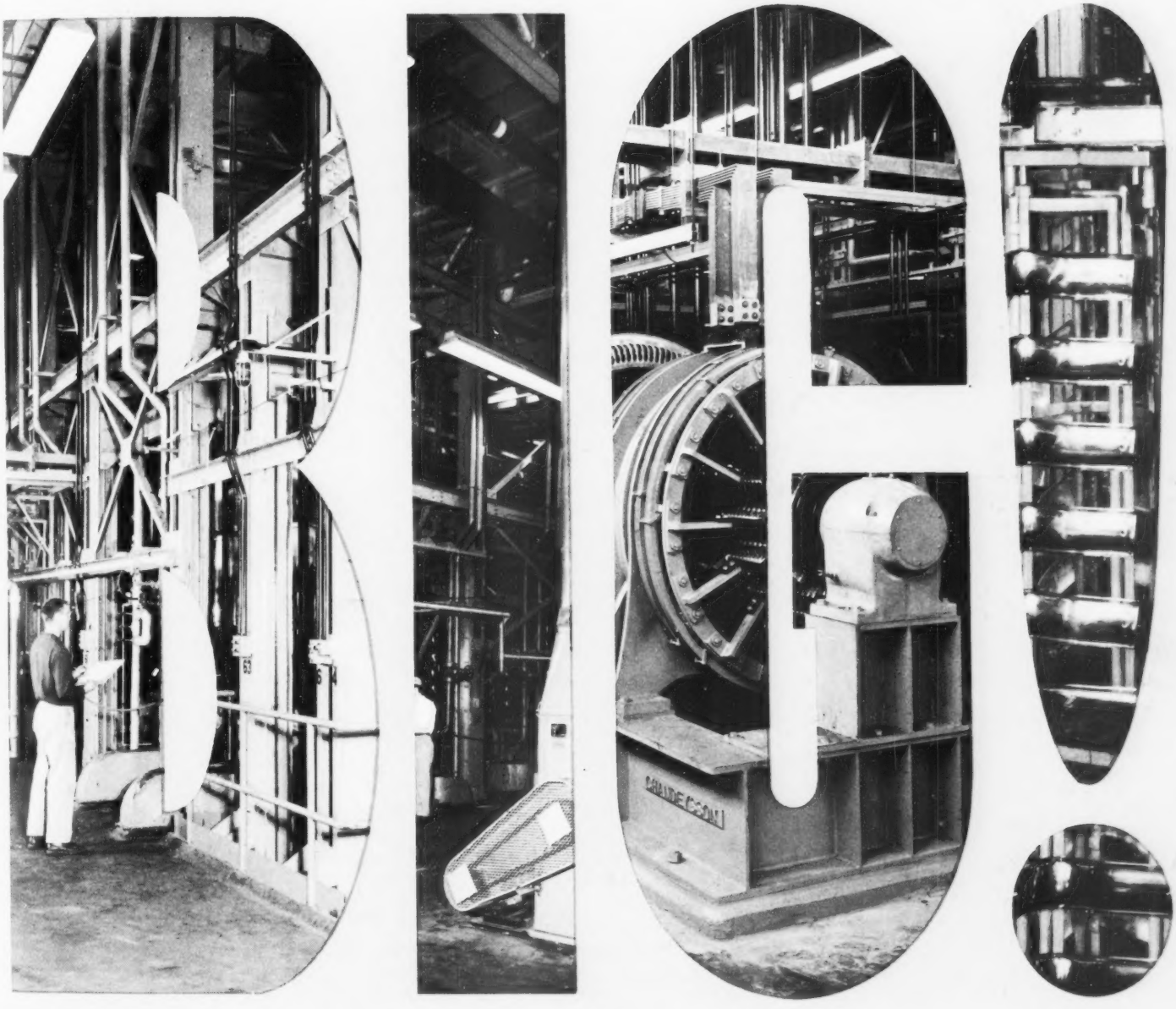
This new Ahco series includes tripoli bars, white bars, and other compounds for buffing surfaces from plastics to non-ferrous metals, steel. and stainless. There is a wide variety of uniform sizes for all types of machines.

Like all Ahco compounds, these new high-speed bars are manufactured under strict laboratory control to assure outstanding performance. Investigate these latest results of Ahco research NOW.

For full details about Ahco Compounds for automatic buffing, write today to Apothecaries Hall Company, 22 Benedict Street, Waterbury, Connecticut.

Apothecaries Hall Co.

WORLD'S *Largest* PLATING PLANT!



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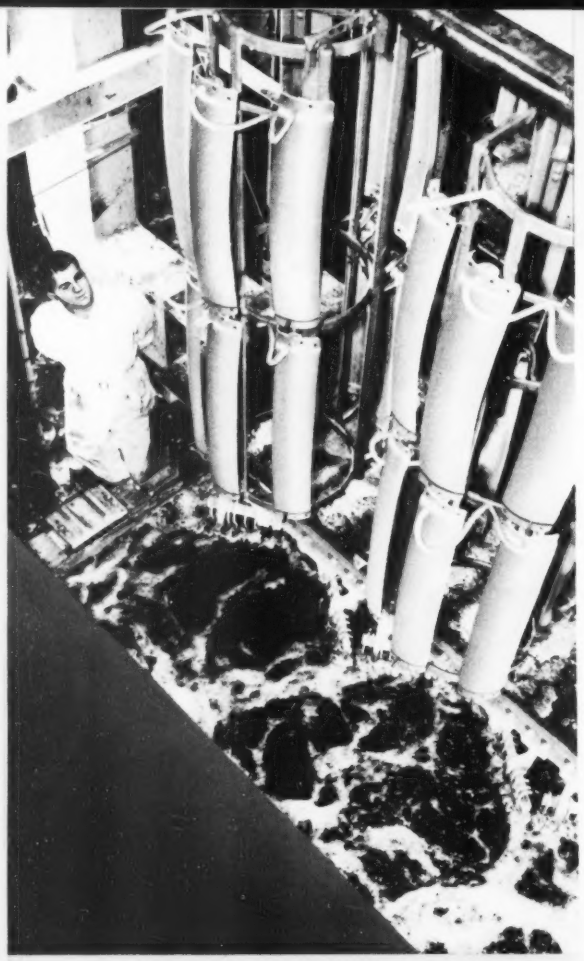
19,200 *Every Day!*

ENGINEERED AND INSTALLED BY THE GEORGE L. NANKERVIS COMPANY

DETROIT, MICHIGAN



WORLD'S *Largest*

THE NANKERVIS STORY

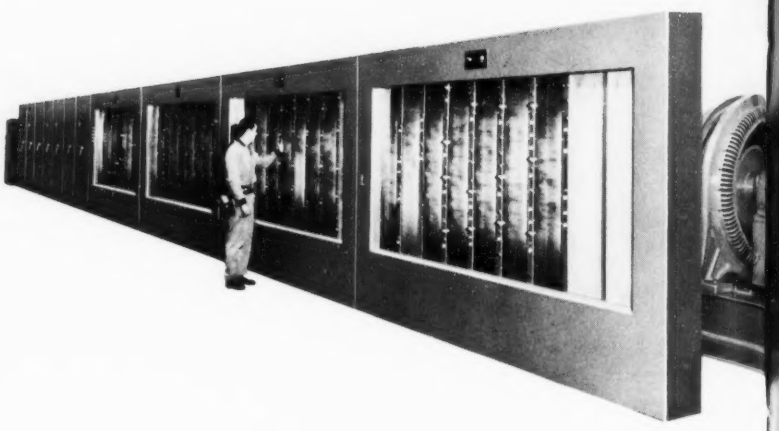
Shortly after the first of the year, the world's largest plating plant began full-scale operation. Built for a large automobile manufacturer, this one plating plant produces all of the bumpers for their entire production.

Engineering and installation of the entire project was done by the George L. Nankervis Company, including the procurement of all the equipment required. This tremendous assignment was accomplished on a team basis by groups of top-flight Nankervis engineers, each specializing in a separate phase of the job; electrical, chemical, mechanical, civil, process piping, structural and others.

Here is the dramatic story of that installation . . . an on-the-scene look into the world's largest plating plant.

HERE'S HOW *Big* IT IS!

- ★ Produces over four acres of plated surface every 16 hours—*plates 1200 automobile bumpers per hour!*
- ★ Covers 180,000 square feet . . . the equal of three football fields.
- ★ Steel used in machine fabrication would equal that used in a 38-story office building with an area of 10,000 square feet per floor.
- ★ 906,000-gallon plating and storage tank capacity—enough to fill 109 tank cars.
- ★ Power used would illuminate 20,000 homes.
- ★ Almost ⅓ of a mile of plating machines.
- ★ More than a half million pounds of copper buss bar used.
- ★ 30 huge blowers supply ventilation—979,500 cubic feet per minute.
- ★ 710 miles of wire used in the installation of the automatic control panels and checking circuits.
- ★ Filtering rate—over 7000 gallons per minute.



COMPLETELY AUTOMATIC

Obviously a job of this size must feature complete automation. Pressing one button starts the machines and from then on it's completely automatic. Operators are required only to load and unload the bumpers.

A unique electro-graphic detector system—large illuminated panels showing the complete electrical system in schematic diagram—is used for maintenance purposes. Each point on these schematics is actually wired to its counterpart on the machine so that if trouble develops it can be spotted easily and quickly.

ENGINEERED AND INSTALLED BY

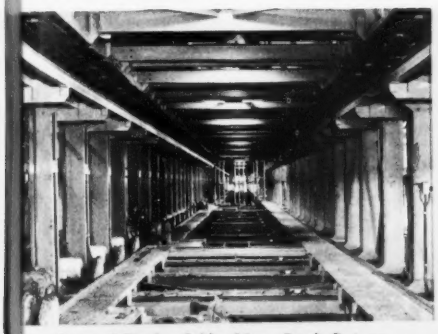
PLATING PLANT!

THE OPERATION

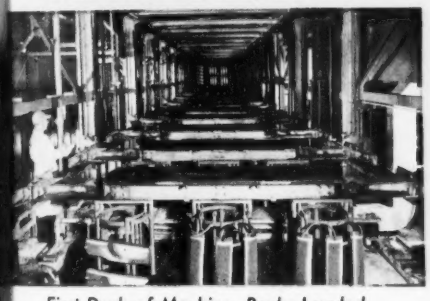
The flow chart at the right illustrates the plating cycle. Bumpers enter the copper-nickel section of the machine. Here they are conveyed through 21 different pre-cleaning, plating and rinsing operations. Under rigid quality control measures, each bumper is given a generous undercoating of copper and nickel plate.

Next, the bumpers leave the plating machine and are conveyed to the first floor for buffing. Returning automatically to the chromium section—they are sent through 10 additional processes—including the chrome plate which produces the lusterous super finish. They now leave the plating area on conveyors for delivery to the Shipping Department.

MACHINES BY MEAKER



Second Deck of Machine, Rack Return



First Deck of Machine, Racks Loaded

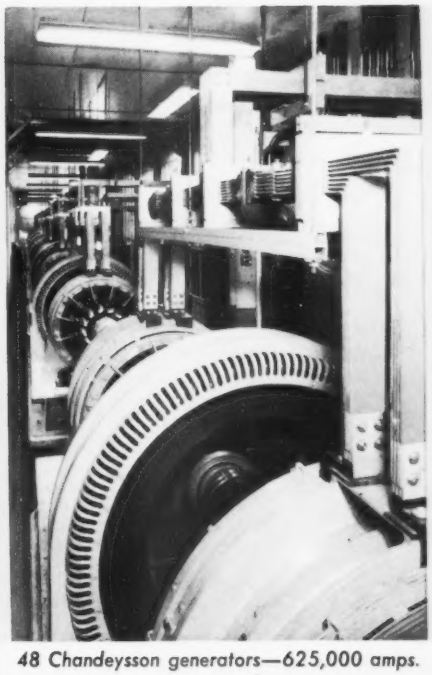
The Meaker Company designed and built the plating machines. Custom-designed for this job, they are selective, batch type machines which are unique in operation. Instead of the racks of bumpers parading through the machine, "follow-the-leader" style, the racks actually pass each other, "leap frog" style, automatically selecting the proper empty plating cell. Batch type operation permitted the use of conforming anodes which give uniform plating to curved surfaces.

Heavy duty construction was used throughout to assure uninterrupted operation at high speeds and 'round the clock duty. And of equal importance—all operating parts of the machine are easily accessible for inspection and maintenance. No "hard-to-get-at" places on these giants.

THE MEAKER COMPANY

Chicago Illinois

POWER BY CHANDEYSSON



48 Chandeysson generators—625,000 amps.

625,000 AMPERES of low voltage current required for this giant plating operation are provided by 48 Chandeysson Generators. These brute-size generators range in sizes from 7500 to 20,000 amperes.

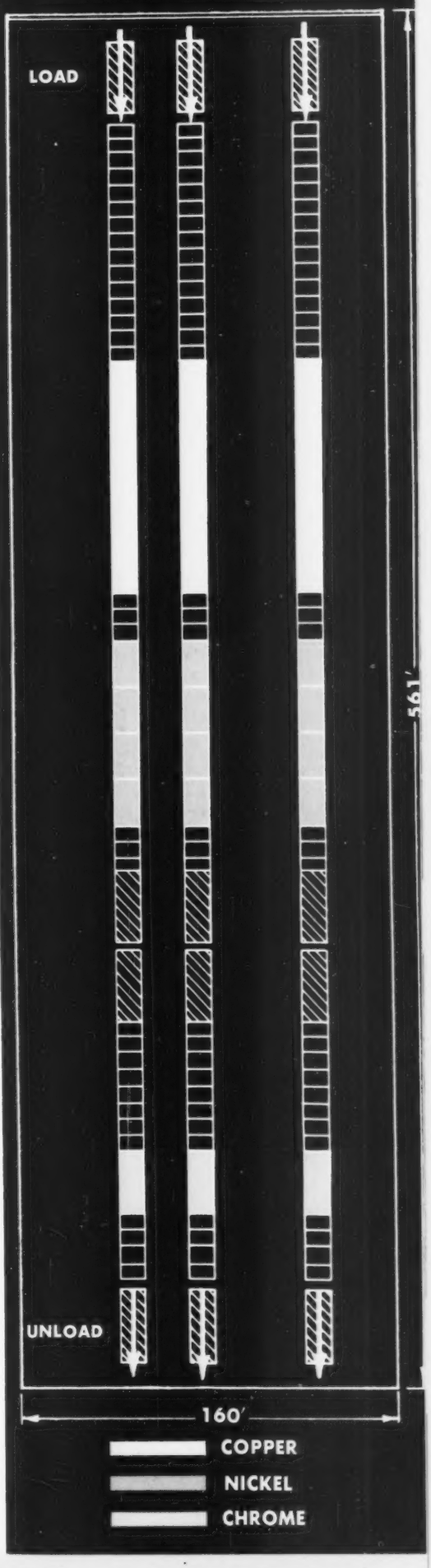
To maintain continuous production from this gigantic automatic plating machine, a dependable power supply is essential. Chandeysson generators were chosen for their reputation of high efficiency with minimum maintenance and for their ability to absorb substantial and frequent overloads without damage.

For half a century, Chandeysson has been a major source of motor-generators to the automotive industry—for 30 years supplying substantially all of the generators to this auto manufacturer—for a total of over 1,350,000 amperes.

Chandeysson GENERATORS

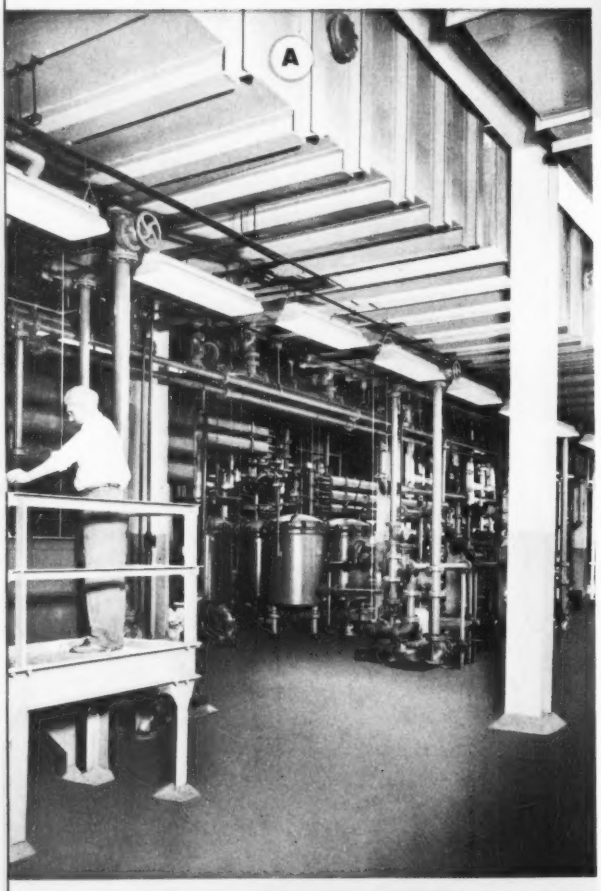
St. Louis Missouri

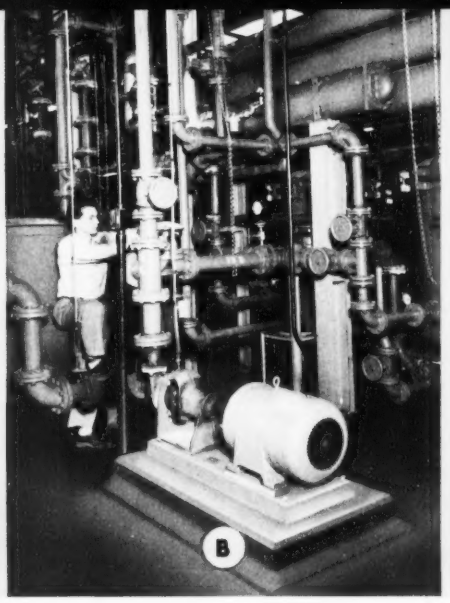
PLAN VIEW—*Plating Area*

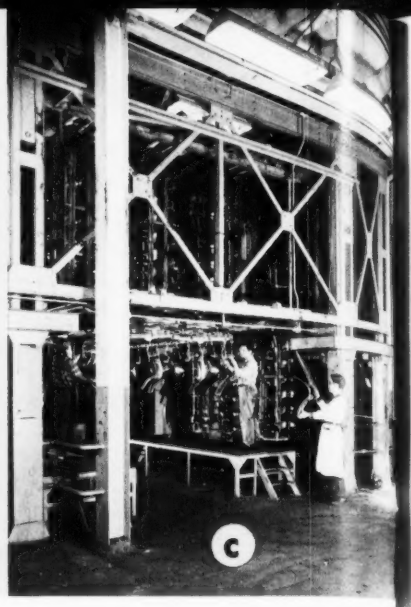


THE GEORGE L. NANKERVIS COMPANY

WORLD'S *Largest* PLATING PLANT







A TWO-FLOOR INSTALLATION: Unique installation of plating tanks—suspended through second floor—can be seen in the picture. This feature gives excellent accessibility to the plating machines above and the accessory equipment below.

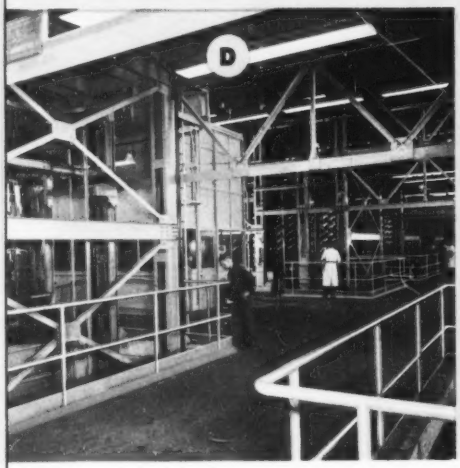
B CIRCULATION of the 430,500 gallons of copper, nickel and chrome solutions through filters and heat exchangers required an intricate process piping system—part of which is shown here.

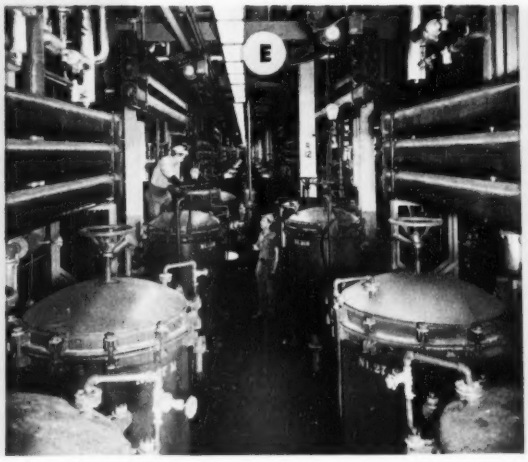
C UNLOADING: Bumpers are being unloaded on the first floor and placed on a conveyor for delivery to the Shipping Department.

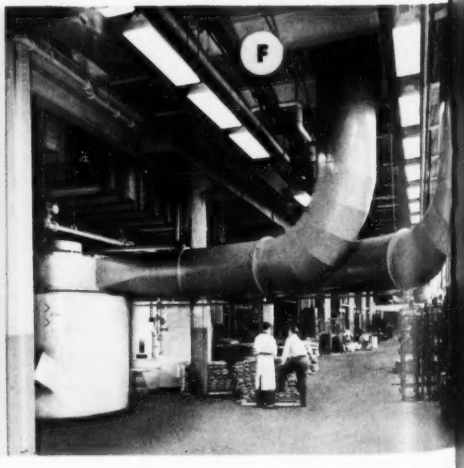
D A BATTERY OF 3 MACHINES comprise the plating installation. Pictured here are the ends of the machines where the bumpers are lowered to the first floor for unloading.

E FILTRATION: 415,000 gallons of solution pass through these filters every hour—for purification—assuring good plating.

F VENTILATION of the system—at the rate of 979,500 cubic feet per minute—is accomplished with huge blowers.







GEORGE L. Nankervis COMPANY

EQUIPMENT AND SUPPLIES
FOR THE METAL-FINISHING INDUSTRY

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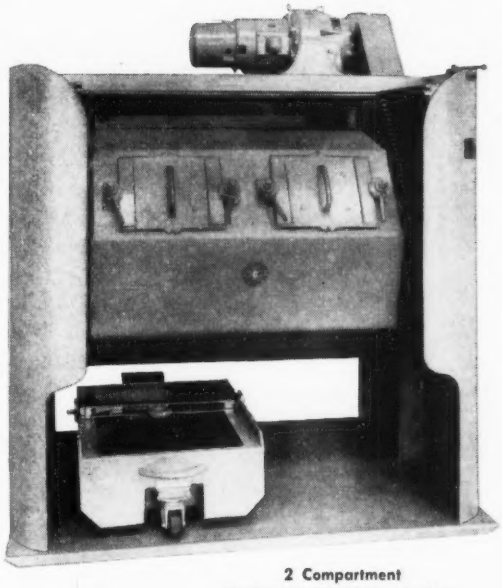
CROWN TUMBLE
DEBURRING EQUIPMENT

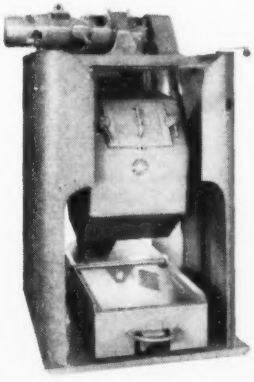


2 Compartment
Horizontal Tumbling Machine

To deburr and tumble finish metal parts

Crown's complete line of newly improved tumbling machines and labor saving accessories provide huge savings in time-costs and labor.

- Light weight — quick acting "seal tite" doors with easily replaceable gasket.
- Front safety guard.
- Forward and reverse switch to rock barrel in rinsing and to position doors for loading and unloading.
- Easily accessible motor and bearings.
- Rubber lined — Neoprene lined — unlined.
- Special machines designed and built

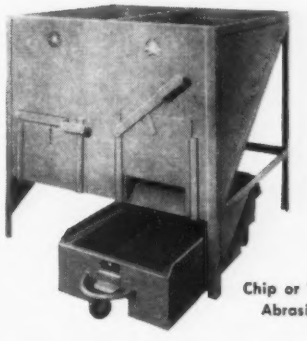


Single Compartment
Horizontal Tumbling Machine

Mechanical Separating Table
Hoist Pan Type

Separating Table
Hand Type

Separator — Motor Drive
with Hopper

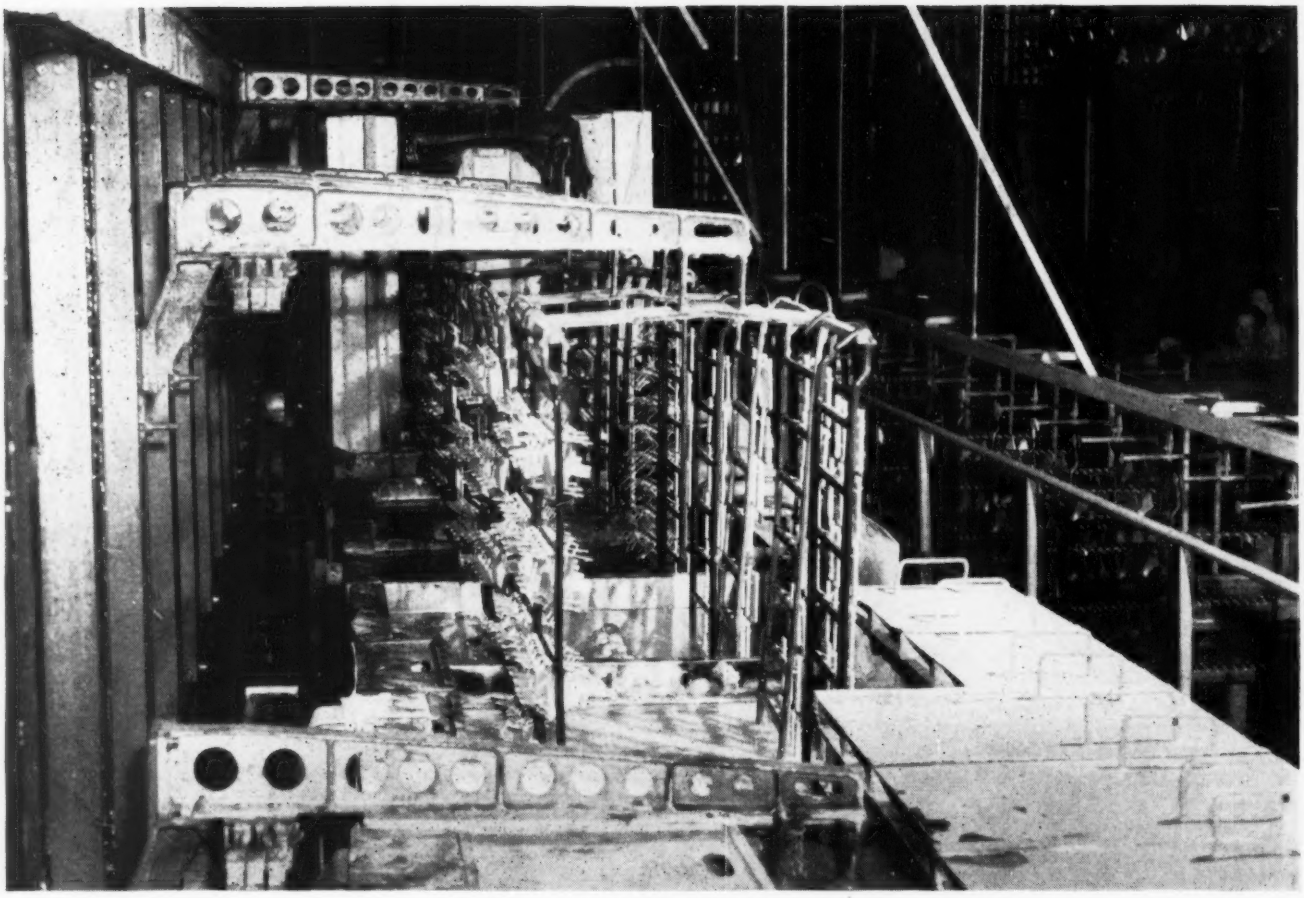


Chip or Tumbling
Abrasive Bin

WRITE FOR OUR COMPLETE CATALOG OF TUMBLING MACHINES AND ACCESSORY EQUIPMENT

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS



Zinc plating with fully automatic equipment

Western Electric uses DUROBRITE® Addition Agent 309 for pure, corrosion-resistant zinc deposits

Two hundred racks an hour! That's a fast pace, but with Du Pont "Durobrite" Addition Agent 309 in the bath, zinc plating stays on schedule! At Western Electric's Indianapolis plant, over 300 different telephone parts are given bright, corrosion-resistant zinc coatings. The pure, uniform zinc deposits are ideal for subsequent bright dipping and passivating.

In 1941 Western Electric started using Du Pont cyanide zinc baths. They're still using them today—and getting the same high rate of deposit and high quality of plating.

Whatever *your* zinc plating needs may be, you'll find that economical "Durobrite" Addition Agent 309 can produce bright, uniform zinc deposits of the highest quality . . . cut production costs in any type of plating equipment.

For More Information about Du Pont plating chemicals, call your nearest district office or use coupon below.

DISTRICT OFFICES:
Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • El Monte (Calif.) • Kansas City† • New York • Philadelphia • Export Division, Wilmington, Del.
†SARADA & PAGE, INC.

Chemicals • Processes • Service
for **ELECTROPLATING**

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REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

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Electrochemicals Dept., Wilmington 98, Del.

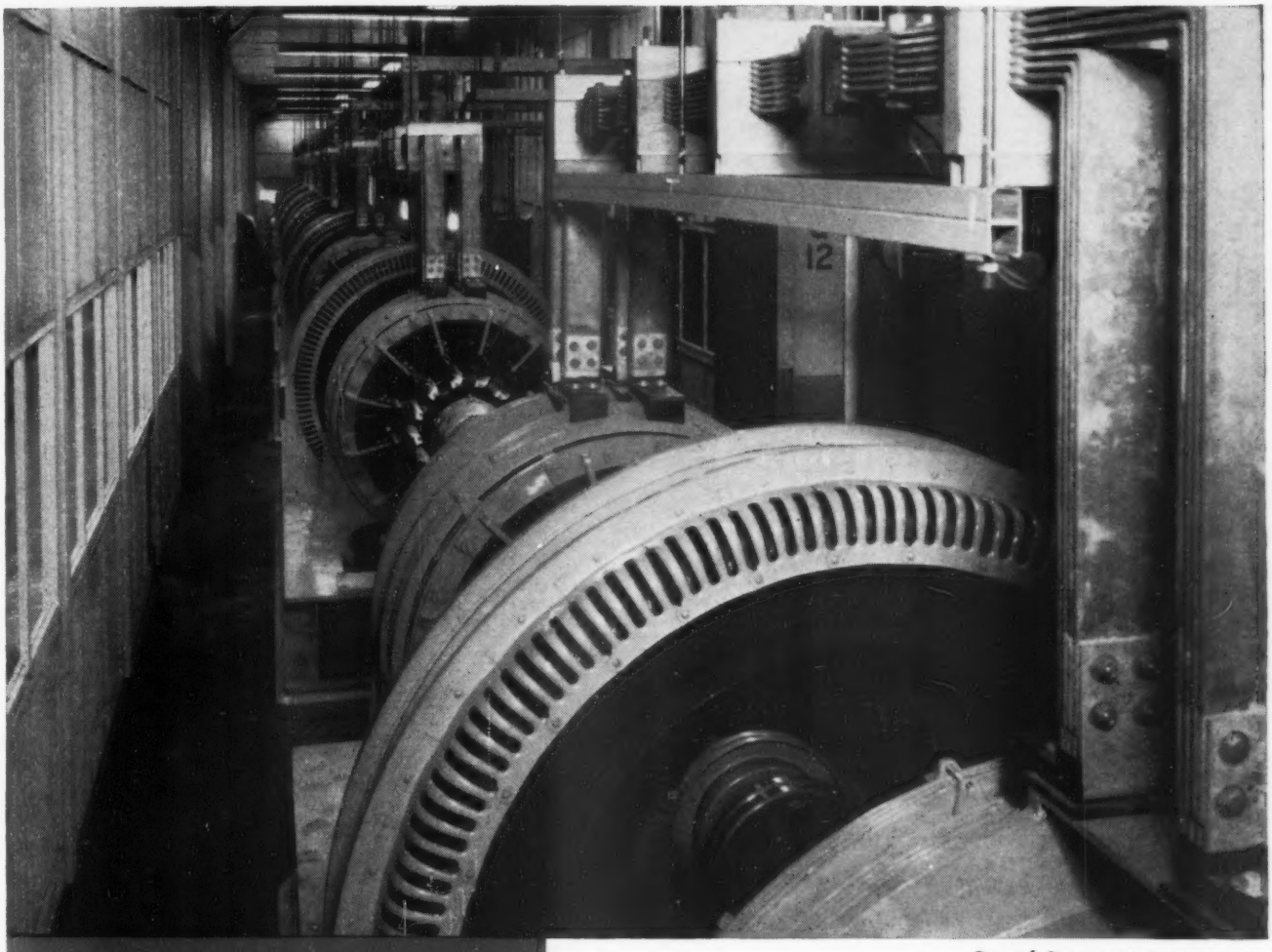
Please send me more information on Du Pont Plating Chemicals —properties, advantages and recommended procedures. I am interested in the following types of plating:

☐ Cadmium Plating ☐ Tin Plating
☐ Zinc Plating ☐ Copper Plating

*Name*_____
*Firm*_____
*Street & No.*_____
*City*_____ *State*_____

625,000 Amps!

FOR THE WORLD'S LARGEST PLATING PLANT



One of 5 generator rooms

SUPPLIED BY 48

Chandeysson

ELECTROLYTIC GENERATORS

Plating at the rate of one bumper every three seconds . . . 19,200 per day . . . allows little time for interruption. To assure a dependable, high-efficiency power supply for this mammoth, automatic plating plant, 48 brute-size Chandeysson motor generators were chosen.

Chandeysson generators were specified exclusively for this multimillion-dollar installation because of their outstanding reputation for trouble-free operation, low maintenance and high overall efficiency . . . and, for their ability to withstand repeated heavy overloads without damage of any sort.

YOU SAVE 4 WAYS...

USE LESS POWER . . . precision-built for efficiency and built-in voltage regulation.

GET MORE OUT OF THE POWER YOU PAY FOR . . . built-in high power factor at no extra cost.

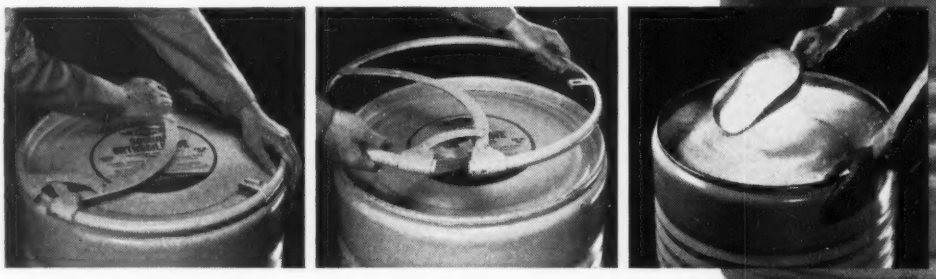
BE SURE OF POWER WHEN YOU NEED IT MOST . . . Chandeysson users report capacity in excess of published statements of 150% momentary and 125% sustained loads, without distress or damage.

ENJOY LIFETIME POWER DIVIDENDS . . . sustained, lifetime overall constant efficiency as high as 85% does not decrease with age or overload.

62

CHANDEYSSON ELECTRIC COMPANY • 4074 Bingham Ave • St. Louis 16, Missouri

DOW SODIUM ORTHOSILICATE



Improved recessed-head lever-lock grips tighter, yet opens and closes more easily; full open-head makes *all* contents readily accessible.

exclusive, improved all-steel drum with full open-head and sturdy lever-lock brings you new shipping, handling and storage advantages

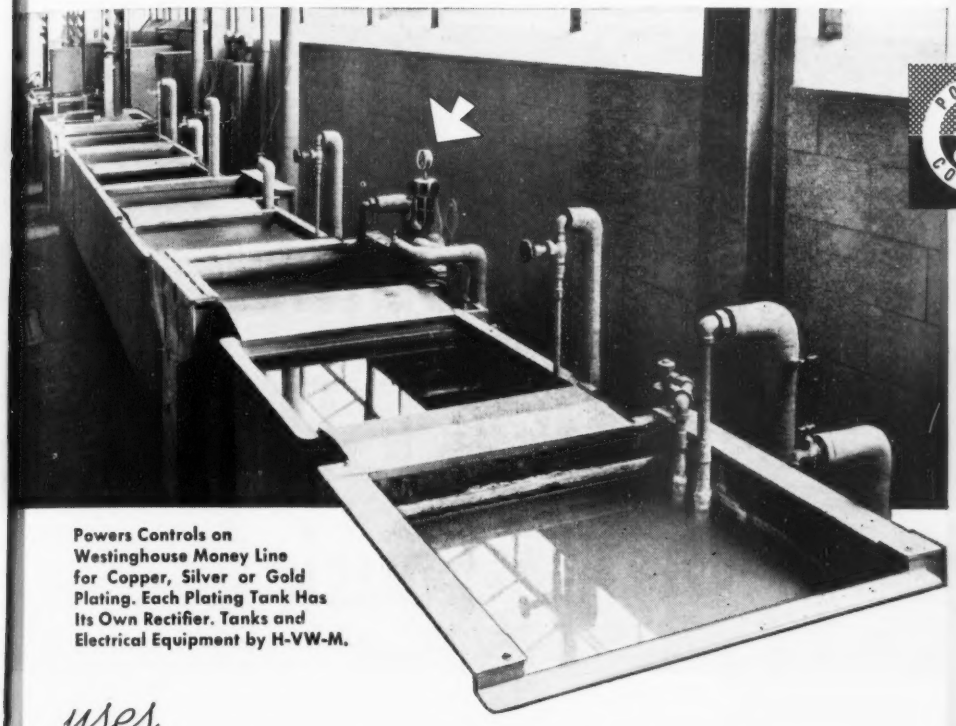
The completely new Dow Sodium Orthosilicate "package" makes an even *better* buy of this *preferred* heavy-duty cleaning compound. Exclusively Dow's, the all-steel drum now available ships better, handles easier, saves you valuable storage space.

Notice the improved swedged-in head design, and the recessed-head lever-lock. These features reduce the chances of drum damage in shipping or storage. A tighter seal is obtained, along with full accessibility to the last scoopful of Sodium Orthosilicate. This sturdy drum is the ideal container under conditions of dampness and heavy moisture. And don't overlook its salvage value.

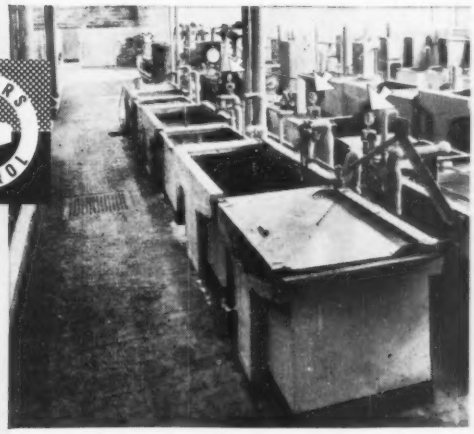
You can get Sodium Orthosilicate in the new drum from Dow plants and distributors. Add its advantages to these *recognized* benefits of Dow Sodium Orthosilicate: uniform high quality and dependably prompt delivery. Result: more good reasons for placing your order with Dow. THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS DOW

AIR ARM DIVISION Westinghouse BOOSTS PLATING OUTPUT—HOLDS REJECTIONS TO VIRTUALLY ZERO



Powers Controls on Westinghouse Money Line for Copper, Silver or Gold Plating. Each Plating Tank Has Its Own Rectifier. Tanks and Electrical Equipment by H-VW-M.

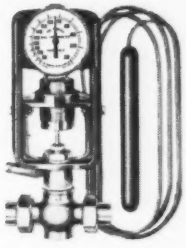


Self-Operating Controls on Aluminum Cleaning Line.

uses

POWERS TEMPERATURE CONTROLS

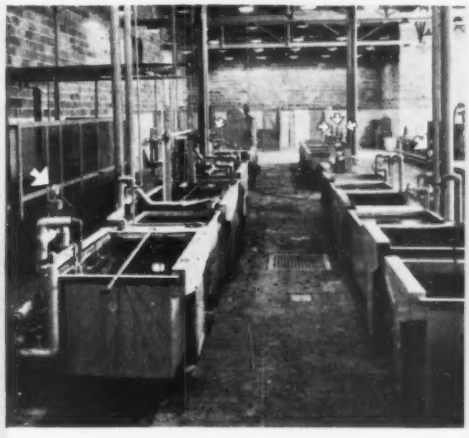
to help maintain stiff standards!



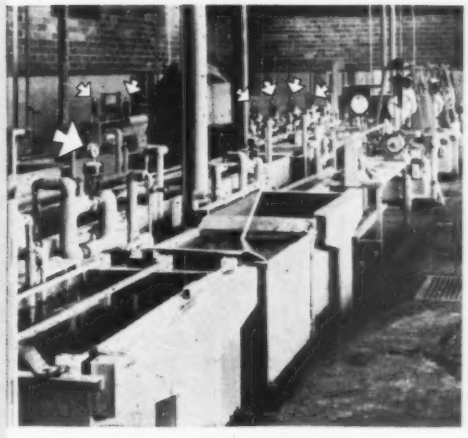
The Air Arm Division of Westinghouse utilizes time study to boost production, standardize methods, train employees, and keep costs competitive. In this new Baltimore plating plant, production *stays* high.

Hundreds of odd shapes are plated in small lots – any of 16 ways. These electronic parts may be aluminum, magnesium or steel. And Powers Self-Operating Temperature Controls help maintain exceptional plating quality. Rejections are virtually zero.

Your plating operation can profit from the use of Powers Temperature Controls. Contact the Powers office nearest you, or write us direct.



Controls on Dual Anodizing Line (left) and Magnesium Cleaning Line.



Tin, Cadmium and Zinc Barrel Plating Lines with Powers Controls.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS • OFFICES IN 60 CITIES IN U.S.A., CANADA, AND MEXICO • SEE YOUR PHONE BOOK

OVER 60 YEARS OF AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

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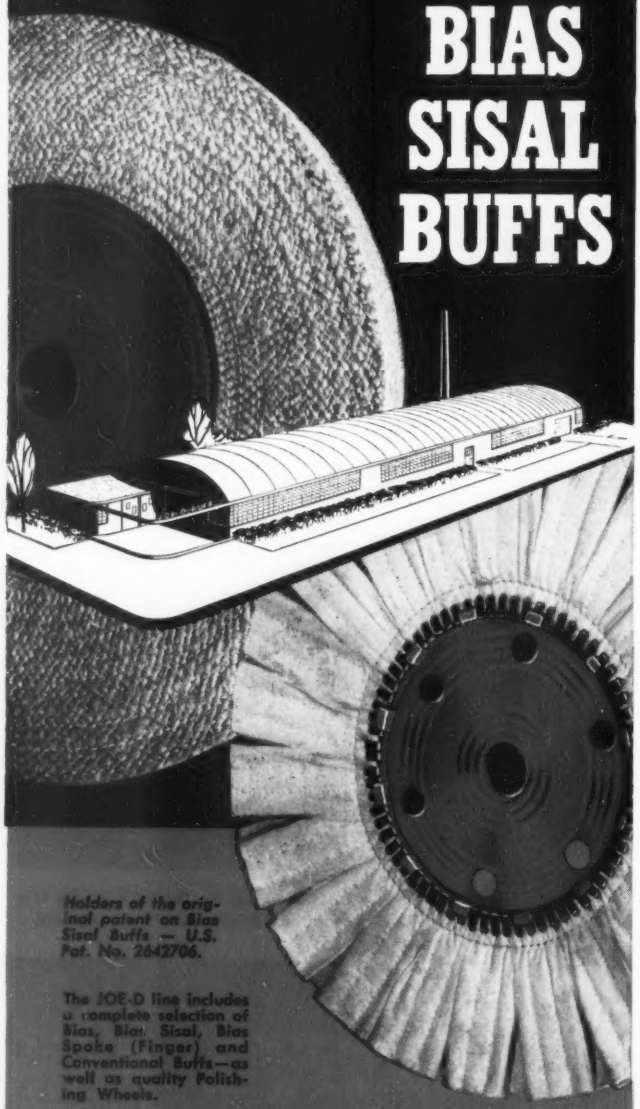
The "House that Sisal Built"

JOE-D ... Originators of

BIAS SISAL BUFFS



Holders of the original patent on Bias Sisal Buffs — U.S. Pat. No. 2642706.

The JOE-D line includes a complete selection of Bias, Bias Sisal, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

Since its founding, the JOE-D Buff Company has specialized in Sisal — constantly experimenting and testing ways to give you faster-cutting, longer-lasting Sisal Buffs. Made of the finest quality imported sisal, specially woven and processed for guaranteed fray-proof performance . . . never a loose end to whip or scratch . . . always an even nap to hold compound and provide better color. For every Sisal Buff requirement, specify JOE-D, the original — and still America's finest — Bias Sisal Buff!

ATTENTION JOBBERS: Some choice territories still available. WRITE TODAY!

the JOE-D Buff Company

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FOR A BRILLIANT,

Tarnish-Proof Finish

Rhodium-plate **will not tarnish** or lose its high reflective quality. It affords excellent protection against atmospheric corrosion... resists surface corrosion under all atmospheric conditions. This enduring quality gives you a versatile finishing material of inestimable value in decorative, industrial and commercial applications.

For valuable data on other properties and applications of RHODIUM PLATE, write for free detailed booklet.

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Now You Can Standardize on the

World's Finest Anode for Chromium Plating

TRAMER

"COPPER CORE" Chromium Anode

"Copper Core" is chemically bonded homogeneously to the lead for its entire length. The entire hook is lead covered for additional protection.

- **This Anode** will conduct 250 amperes based on copper area alone.

  Natural flow of current makes entire surface self-cleaning, insuring complete saturation, instant distribution of current, and unusual throwing power. Greatly reduces plating time for a given thickness of deposit.

- **"Copper Core"** distributes current equally throughout the entire length of anode.

  The anode is insulated above and below the solution level—which prevents flow of heavy surface currents and burning off at solution line. Conductivity is uniform at all solution levels, regulated only by the cathode depth.

- **"Copper Core"** and point current construction, aids in immediate coverage.

  A one-piece copper hook maintains perfect contact—no heating at point of contact, no current failures to solution. "Copper Core" Anodes do not warp out of shape.

The GILBERT TRAMER Co.

POLISHING • PLATING and CHEMICAL • EQUIPMENT

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with prices reduced up to

30%

For example, an anode that formerly cost $34.00 is reduced to $23.00. Now you can charge your tanks with the unequaled Copper Core Chromium Anode ***at the same cost*** as with conventional anodes. Here's how:

Space our Copper Core Anodes on 8"-14" centers, which is all that is usually required. Then note the difference: immediate coverage, excellent throwing power, and additional current density, plus four to five years of service. This is your real opportunity to become acquainted!

Write for quotation today. Simply tell us the length of your anodes and the number required, or use the coupon on this page. We will quote on 5% tin-lead alloy unless otherwise specified. You will have our prices promptly—and deliveries are good.

* * *

Our thanks to the trade for its booming demand for our outstanding Copper Core Chromium Anodes. Introduced five years ago, they have enjoyed a rapidly growing market which has made possible this price cut through immensely increased production.

The Gilbert Tramer Co.
1217 Main Avenue
Cleveland 13, Ohio

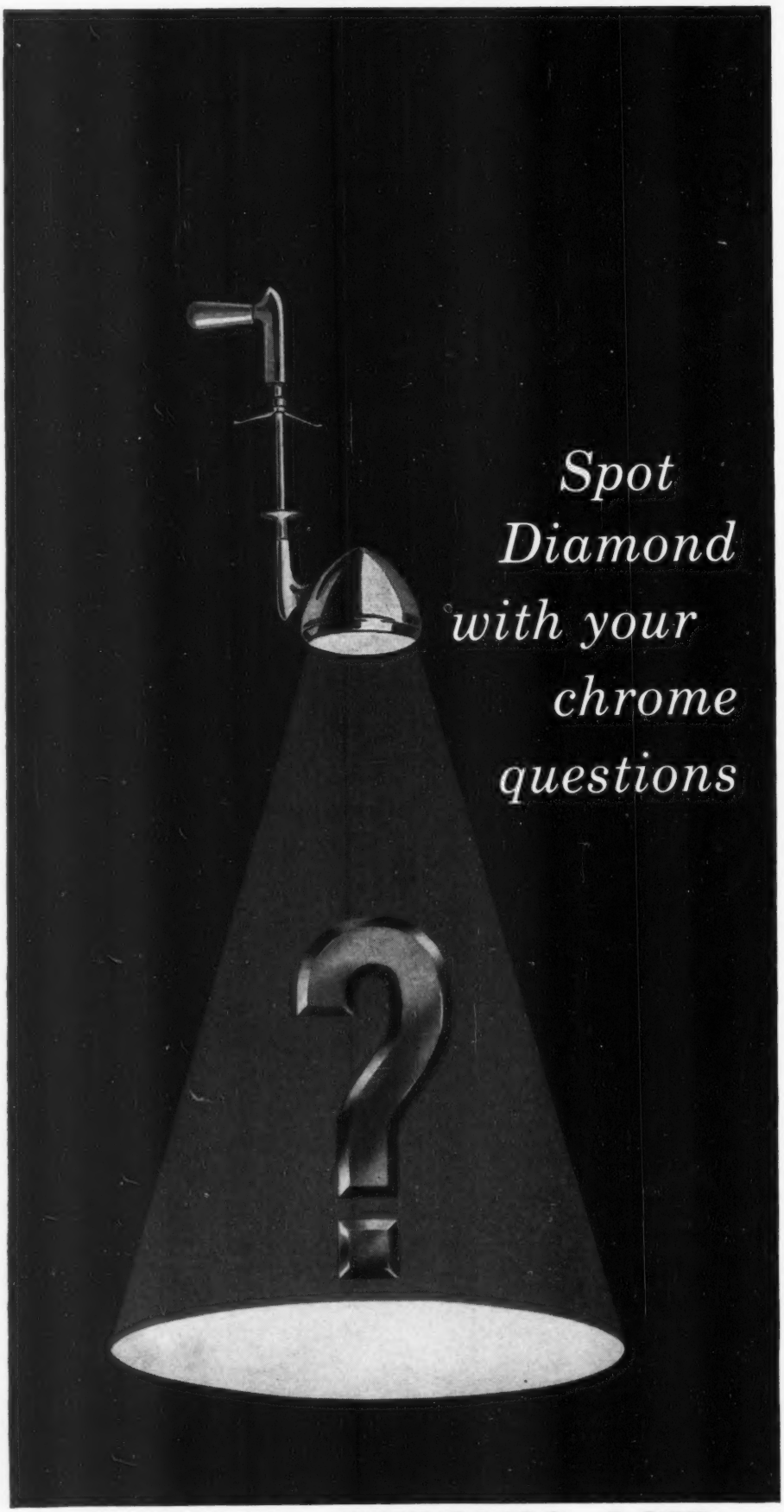
Please send us promptly your quotation on Copper Core Chromium Anodes as follows:

Length ..... No. Required ..... 5% tin-lead ..... Other .....
Length ..... No. Required ..... 5% tin-lead ..... Other .....
Length ..... No. Required ..... 5% tin-lead ..... Other .....

Individual .....

Company .....

Address .....



DIAMOND CHROMIC ACID

CHEMICAL PROGRESS WEEK-MAY 16-21

A BETTER AMERICA THROUGH CHEMICAL PROGRESS

Let DIAMOND step into the spotlight when you have questions about chrome plating. DIAMOND's Chromium Chemicals Division is ready with Technical Specialists who do nothing else. What's more, this service doesn't cost you one cent extra.

Behind the answer to every question about chrome plating is a wealth of knowledge developed from first-hand experience. In making chromic acid we control more steps than any other producer. From this beginning—and many related experiences since—comes an intimate understanding of chrome plating problems. What you are looking for may well be found in what DIAMOND *knows*.

Nine warehousing points and nine sales offices across the country assure you fast service, uninterrupted supply. DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, Ohio.

DIAMOND ALKALI CHEMICALS ®

THEY ARE BACKING THEIR APPROVAL WITH ORDERS . . . . .

FOR THE NEW "STEVADOER" PLATING AND PROCESSING MACHINE *by* STEVENS

Discriminating metal finishing experts who have viewed it in operation are strong in their approval of the "Stevadoer," new automatic plating and processing machine by Stevens . . . and they are backing up their approval with orders.

The "Stevadoer" is all that its name implies – strong, rugged, with smooth vertical and horizontal movement. In addition it provides unlimited lift and heavy load capacity.

The side-arm design, pioneered by Stevens, which eliminates operating mechanism over solutions, still provides for delayed set-down mechanisms and skip tracks.

You'll like the featured "built-in" safety cat walk that can be provided between the processing tanks and the mechanism on two-row machines, making anode servicing and tank or mechanical inspection an easy matter.

The new Stevens Stev-O-Matic automatic loader and unloader working with the new "Stevadoer" offers the last word in automation.

Write today for more information on this remarkable new machine for metal finishing.

See another new Stevens engineering triumph . . . the new "Little Steve" Automatic Plating Machine at the 4th Industrial Finishing Exposition – Booth 112, Public Auditorium – June 20 to 23, Cleveland, Ohio.

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Metal Finishing equipment and supplies from castings or stampings to finished product.

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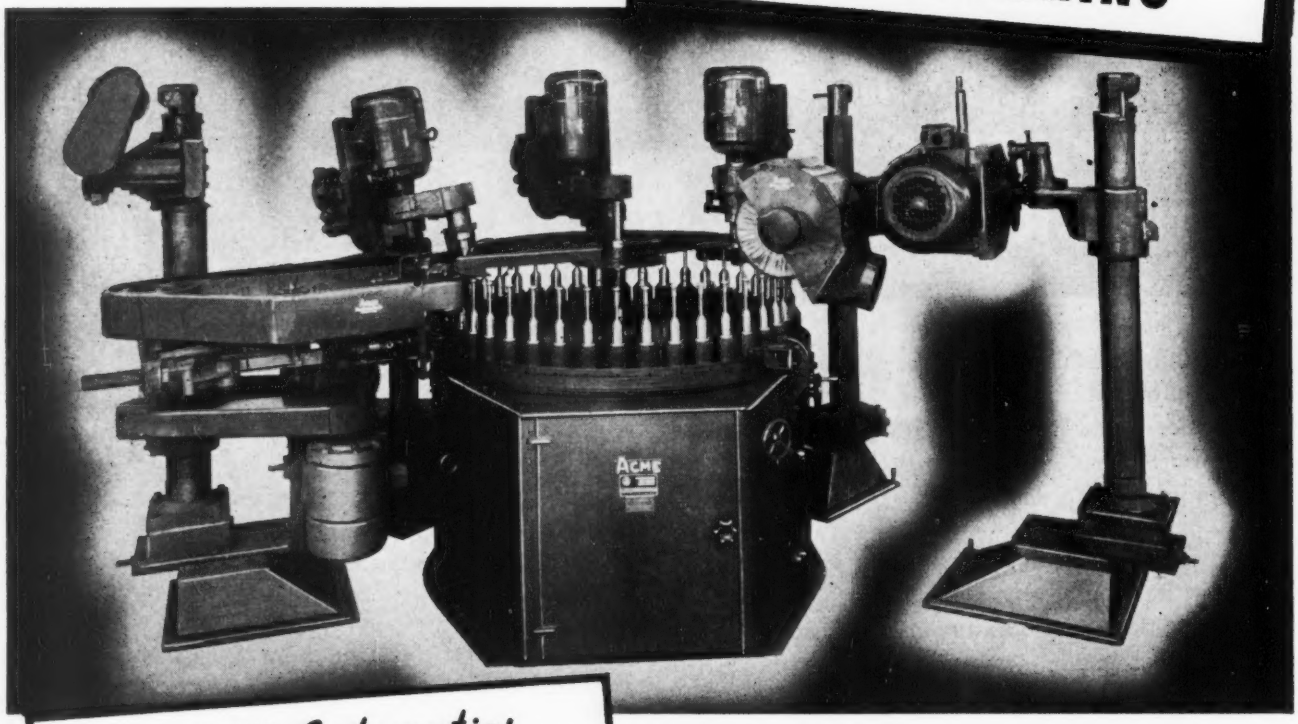
INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

ACME *Automatics*
OFFER THE SOLUTION to MANY PROBLEMS of
PRODUCTION FINISHING

Production finishing demands not only high output at low unit cost, but also a uniform finish meeting required standards. Acme Automatics can be depended upon to deliver high production at minimum cost and maintain your finish requirements. Acme performance has been proved in production for nearly half a century.

POLISHING and BUFFING
DE-BURRING
WIRE BRUSHING
MICRO-FINISHING



ROTARY *Automatics*
STRAIGHT LINE *Automatics*
SEMI-*Automatics*
Catalogs on Request

Recommendations & Quotations

For recommendations, send blue prints of part or samples before and after finishing operations, together with detailed information on finishing operations and production requirements. If production methods will cut your costs, we can set your job up in our experimental processing department and you can inspect the machines in operation.

SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*
1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.
Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 35 YEARS

"tank life DOUBLED with . . .

Cowles NS CLEANER!"

reports large Midwestern manufacturer

That's what happened when this major manufacturer put Cowles NS —heavy duty soak cleaner—in its cleaner tanks. Tank life was doubled, quality of cleaning was improved, and total cost was reduced greatly.

Cowles NS eliminates soap scum build-up to assure long tank life and prevent deposition of scum on cleaned parts. High emulsification properties of Cowles NS keep the tank clear and reduce the costly, time-consuming process of dumping, cleaning and recharging tanks—jobs can be run *up to twice as long* without changing.

Cowles NS provides outstanding cleaning results and its flexibility permits its successful application in both porcelain enamel plants and in plating plants.

Your Cowles Technical Representative will be very happy to discuss your soak cleaning problems with you and help bring the same exceptional results with Cowles NS that this and many other plants have experienced. Write or call today.

Cowles CHEMICAL COMPANY
METAL CLEANER DEPT.

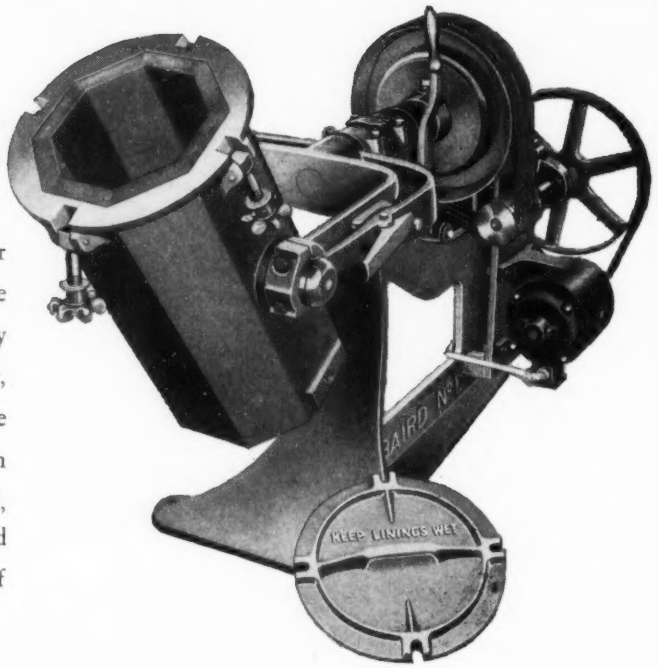
7016 Euclid Avenue • Cleveland 3, Ohio

ASK BAIRD ABOUT IT!

TUMBLING BARRELS FOR MORE THAN 50 YEARS

There's a BARREL in the BAIRD LINE to suit your *Specific Job*

Defense production not only calls for a greatly increased number of barrels, but also for a wide variety of types. The Baird line of Tumbling Equipment and Barrels includes practically every type required for Burnishing, Degreasing, Deburring, Drying, Heating, Japanning, Cleaning and Coating. Barrel shapes are round, bottle-shaped, octagonal, polygonal . . . closed or open mouth . . . cast iron, fabricated steel, sheet brass, Monel, Everdur, stainless steel or wood . . . and metal barrels may be lined with wood, rubber, etc., also with inner shell for introduction of live steam.



Baird manufacture of Tumbling Equipment covers well over a half century . . . and a wealth of experience . . . from the days of belt drive to modern direct motor with an added motor for automatic tilting, if desired.

We illustrate two types . . . (above) No. 1 Baird Single Ball Burnishing Machine, motor drive with tilting, rolling, lined barrel . . . (left) Baird Model D Single Oblique Tilting Tumbler, motor driven. Manual tilting, polygonal, round corner bottom sheet metal barrel. Automatic tilting, if desired.

If you have a finishing problem, send for bulletins. Ask Baird about the best method for your specific job.

WRITE DEPT. MF.

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

6BA52

Why RICHARDSON-ALLEN

SELENIUM RECTIFIERS ?

ACCEPTANCE Richardson-Allen is the outstanding manufacturer in the field. Our selenium rectifiers are used extensively by the best Blue Book companies.

SPECIALIZATION Richardson-Allen has been building ***only*** selenium rectifiers for the past ten years.

SKILLED STAFF The Richardson-Allen staff includes five engineers who are skilled specialists in the design and manufacture of selenium rectifiers.

WE MAKE OUR OWN We build over 60% of the components that go into Richardson-Allen selenium rectifiers, including transformers, reactors, and cabinets.

A COMPLETE LINE Richardson-Allen manufactures a complete line of plating and anodizing selenium rectifiers.

FULL BASIC DATA Richardson-Allen has the most comprehensive selenium stack data, derived from 10,000 separate readings taken in the field and 35,000 hours of actual field use.

COMPETITIVE PRICES Pricewise, Richardson-Allen rectifiers are competitive with the higher grades, and Richardson-Allen "know-how" is offered at no additional cost.

PROVED PERFORMANCE Can you afford the hazards of rectifier breakdown and production losses? You take no risk with the proved reliability of Richardson-Allen equipment.

PIN JACK SERVICE Richardson-Allen offers pin jacks on all plating and anodizing equipment, so that you can tell how your rectifier is standing up. You send us the readings on your rectifier. We send you our calculations to show its condition. We are interested in the rectifier you buy even after it is sold and paid for. ***This service is exclusive with Richardson-Allen.***

EXPERIENCE We offer you ten years of knowledge and experience in making fine equipment, with an unequaled reputation for standing behind our products.

ASK FOR OUR TECHNICAL LITERATURE

THE BEST IN AC-DC CONVERSION

RICHARDSON-ALLEN CORPORATION

RECTIFIER SPECIALISTS

A manufacturing affiliate of WESLEY BLOCK AND COMPANY

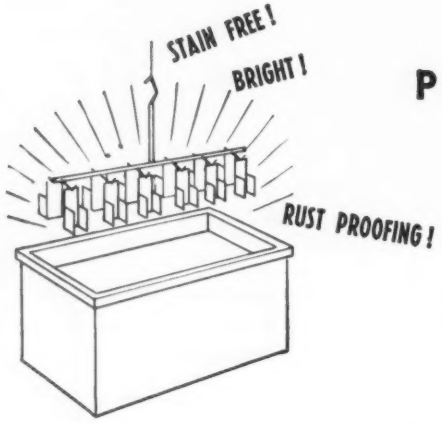
39-15 MAIN STREET, FLUSHING, NEW YORK

IN CANADA: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Ontario

NEW! Magic Dry

Your answer to *Trouble-Free PLATING*

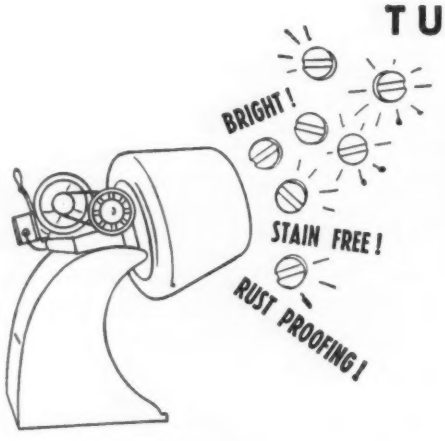
by Eliminating { STAINING
DULLNESS
RUSTING



PLATING

MAGIC DRY is a remarkable new product that helps eliminate rejects and increases production. In plating, MAGIC DRY is used in the rinse cycle in concentration of 1-2 ozs. for every 10 gallons of water 180° to 212° F. MAGIC DRY will eliminate plating stains and maintain the bright finish of the plated work. It will also provide a rustproofing finish that will be welcomed by the plating industry.

TUMBLING



Four ozs. of MAGIC DRY per gallon of water applied to tumbled parts at room temperature immediately after tumbling retains the bright finish of the tumbled parts and thereby prevents them from rusting or staining.

MAGIC DRY is now available in 55 gallon drums or 5 gallon containers.

★ ★ ★ ★ ★

Send for a sample of

Magic Dry

and be convinced

★ ★ ★ ★ ★

Manufacturers of Black Magic blackening processes, Metal Cleaners, Rust Proofing Oils & Waxes, Heat Treating Salts.

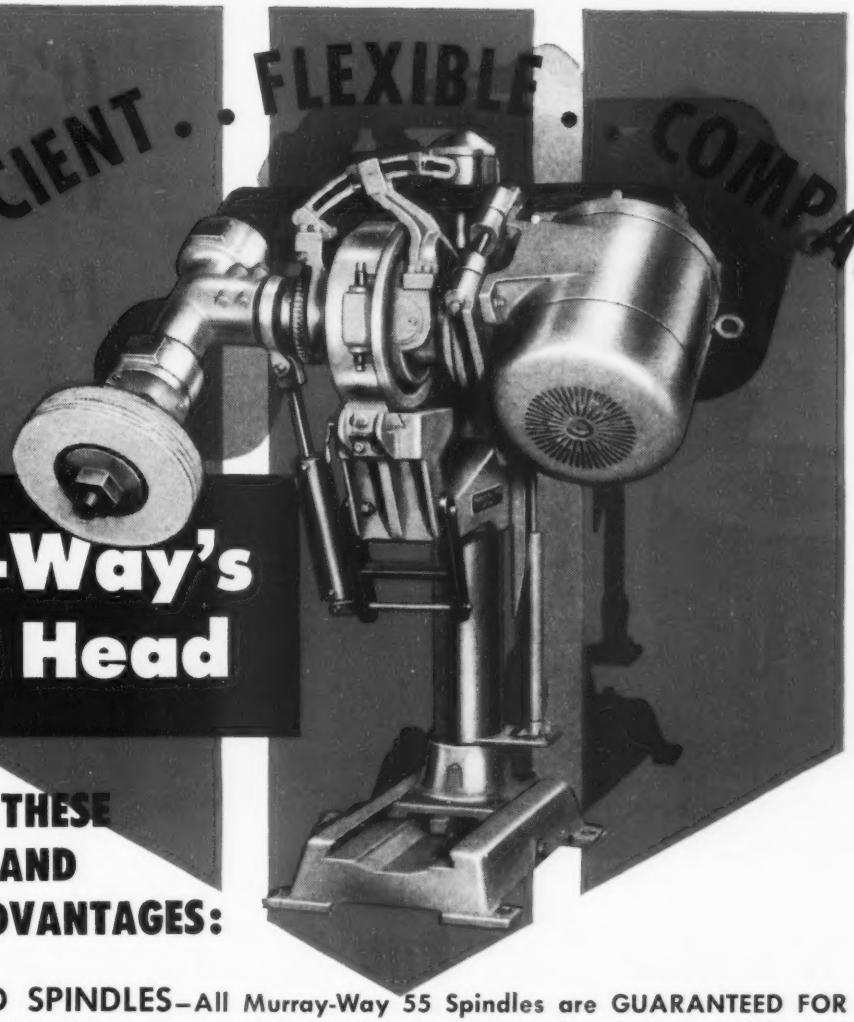
THE MITCHELL-BRADFORD CHEMICAL CO.

2442 MAIN ST. STRATFORD, CONNECTICUT

Mitchell-Bradford

QUALITY PRODUCTS OF CHEMICAL RESEARCH

EFFICIENT . . FLEXIBLE . . COMPACT



Murray-Way's New #55 Head

GIVES YOU THESE POLISHING AND BUFFING ADVANTAGES:

GUARANTEED SPINDLES—All Murray-Way 55 Spindles are GUARANTEED FOR 3 YEARS. Factory-tested spindles incorporate heavy-duty, anti-friction bearings that require no grease or oil and are sealed against dirt for trouble free performance.

RIGHT OR LEFT HAND OPERATION—By simply inverting the head assembly, the 55 Heads may be used for either right or left hand operation.

SMALL FLOOR SPACE—The 55 Series Heads will install in line on 5'8" centers. They conserve floor space, economize on conveyors, and reduce fixture requirements.

UNIVERSAL POSITIONING—With the Murray-Way adjustable fulcrum head, you get universal positioning by means of simple, accessible adjustment controls at the front of the head.

RUGGED—These heads are truly heavy-duty workhorses with 30 H.P. capacity.

FULL WORK CONTACT—On even the most irregular work shapes, Murray-Way's 55 Heads remain in constant contact—NO EXTRA PASSES—LOWER OPERATING COST—MORE PRODUCTION.

The technical know-how of Murray-Way's experienced engineers is the reason that production men who want a BETTER WAY . . . SPECIFY MURRAY-WAY.

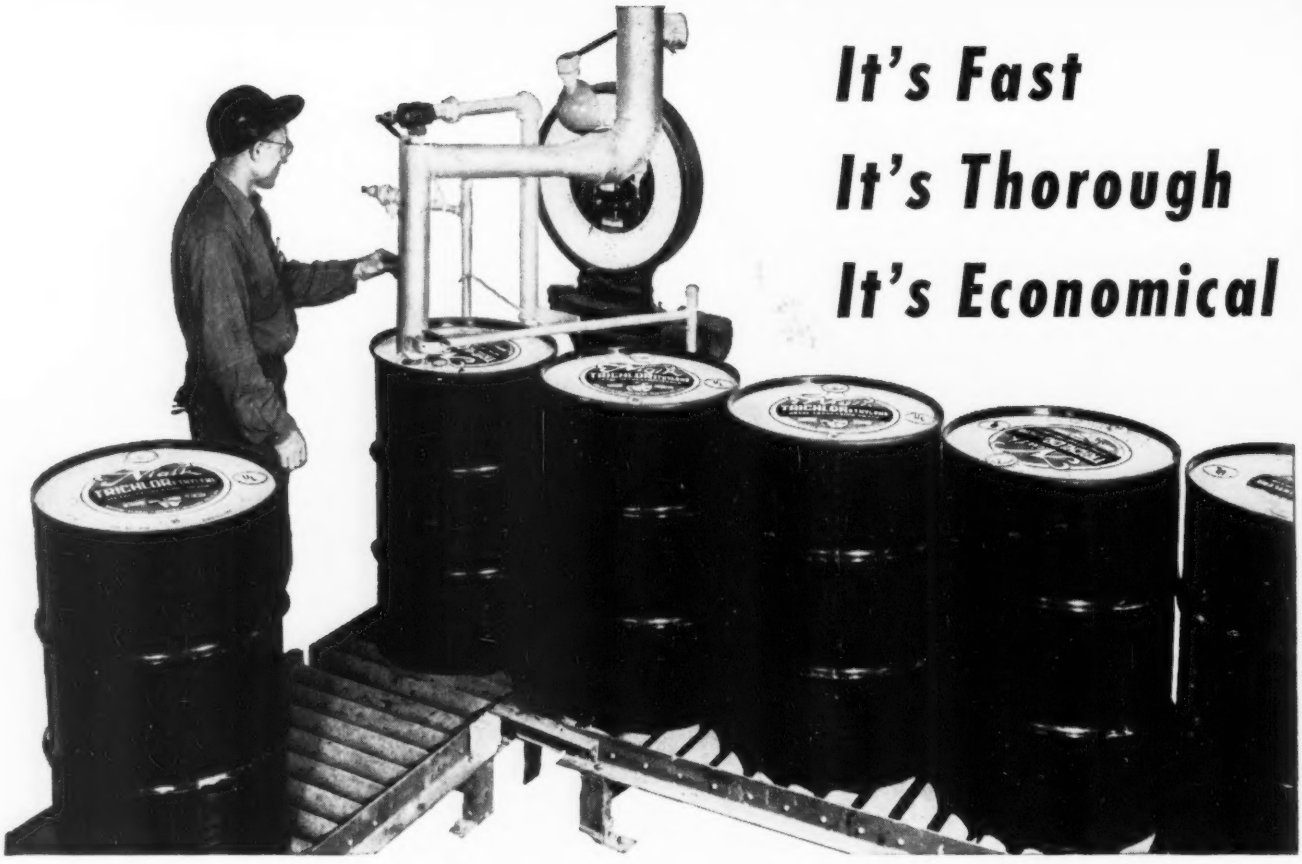
FOR COMPLETE INFORMATION WRITE

MURRAY WAY

MURRAY-WAY CORPORATION

P. O. BOX 180, MAPLE ROAD EAST • BIRMINGHAM, MICH.

Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.



It's Fast
It's Thorough
It's Economical

It's your Best Buy in Degreasing Agents!

Nialk® TRICHLORethylene

When you stack up all the advantages offered by Nialk TRICHLORethylene you'll understand why more and more companies are standardizing on it for metal parts degreasing.

Versatile—the ideal organic solvent for removing practically every kind of foreign matter—waxes, greases, oils, gums, tars—even chips. Leaves parts clean, warm, dry, ready for assembly, inspection or surface treatment.

Fast—Acts quickly, cleans and dries rapidly. Its low boiling point (86.6°-87.8°C, based on standard ASTM tests) permits vaporization at low steam temperatures.

Thorough—Low viscosity (0.58 centipoises at 20°C) and low surface tension (about 29 dynes per cm at 30°C) assure diffusion into pores and relatively inaccessible openings.

Economical—Stable and completely usable after distillation. Cuts power consumption . . . can be heated by gas, steam or electricity. Gives concentrated vapor at only 188°F. Specific heat is less than ¼ that of water. Cuts vapor loss—high vapor density (4.5 times that of air) assures proper vapor level at all times.

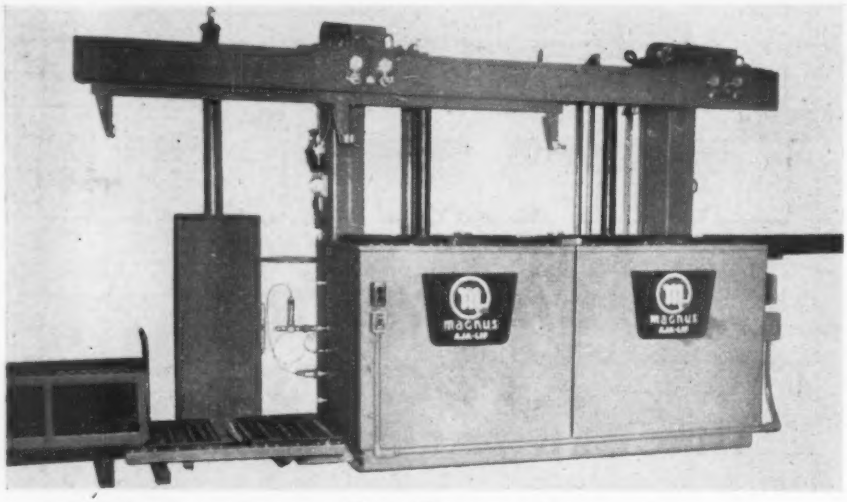
Safe—Has neither flash point nor fire point; classed as nonflammable at room temperatures, only moderately flammable at higher temperatures (Underwriters' Laboratories rating 3).

Order by the drum, carload or tank car. Deliveries can be made promptly. A request on your letterhead will bring you a free copy of our Nialk TRICHLORethylene booklet.

NIAGARA ALKALI COMPANY

60 East 42nd Street
New York 17, New York

NIALK® Liquid Chlorine • NIALK Caustic Potash • NIALK Carbonate of Potash
NIALK Paradichlorobenzene • NIALK Caustic Soda • NIALK TRICHLORethylene
NIAGATHAL® (Tetrachloro Phthalic Anhydride)



NOW – Batch dip cleaning... ...Automatically!

Through the elimination of manual handling, this new Magnus "Aja-Lif Automatic" cleaning method makes processing of work in baskets more advantageous than ever before.

Designed for any number of operations, the machine is fully automatic and can be used with solvent, alkali or acid solutions. It is available in either straight line or U-shape to fit in any production line.

The Magnus "Aja-Lif Automatic" has two unique features: "Air lift loading" which automatically raises the work to the top of the machine, and "nu-matic push device" which positions the baskets of work for each stage of cleaning and following operations. Cleaning is automatically accomplished by vigorous agitation of the work in the solution. All motions are performed by air power.

Before committing yourself to any type of cleaning equipment, it will be to your advantage to investigate this new cleaning method.

magnus

Equipment Division

MAGNUS CHEMICAL CO., INC.

11 South Ave., Garwood, N. J.

In Canada: Magnus Chemicals, Ltd., Montreal

Service Representatives in Principal Cities

tanks have from one to three inlets and drains instead of one inlet and drain for each compartment, facilitating the plumbing problem. Provision is made for agitators and steam coils. The outsides of the tanks are clad in stainless to conform in appearance with the other modern equipment in the plant.

Filter

The Murray-Way Corp., Dept. MF, Birmingham, Mich.

An improved automatic filter for all types of industrial filtration, known as the Model 10, features basic improvements in the removal of the contaminant, elimination of tuning rods, and an enlarged filtering area.

The filter automatically rotates fresh filtering area into position while simultaneously ejecting the contaminated cake. Filtering screen is divided into eight equal parts, screw-mounted. Filter screen material and size of screen opening can be supplied in Monel, stainless steel, brass or bronze to fit all requirements.

Contaminant retained on the filter screen is removed by air pressure and is dropped directly into the exit chute. Through the filter float control the air unit is actuated only when the drum turns. That operation occurs only when the contaminant cake restricts filtering and the liquid level rises to operate the float control.

Elimination of the tuning rods permits the enlargement of the filtering area approximately 15% without enlarging the small floor area already occupied.

The filter may be used on an individual machine unit, or as a central filter for many units. The gallon capacity of filtration may be easily increased by adding filter drums in tandem, separately, or in the same tank to meet requirements.

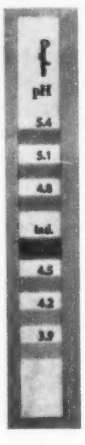
Masks and Rack Coats

Chem Products, Inc., Dept. MF, Silas Deane Highway, Rocky Hill, Conn.

The above firm offers a new series of rack coatings claimed to have better plating stop-off and longer rack life. The masks and rack coats are especially formulated and are available in air-dry, hot-melts, and baked types. According to the manufacturer, all are designed to meet the rigid requirements and varying conditions of the plating industry.

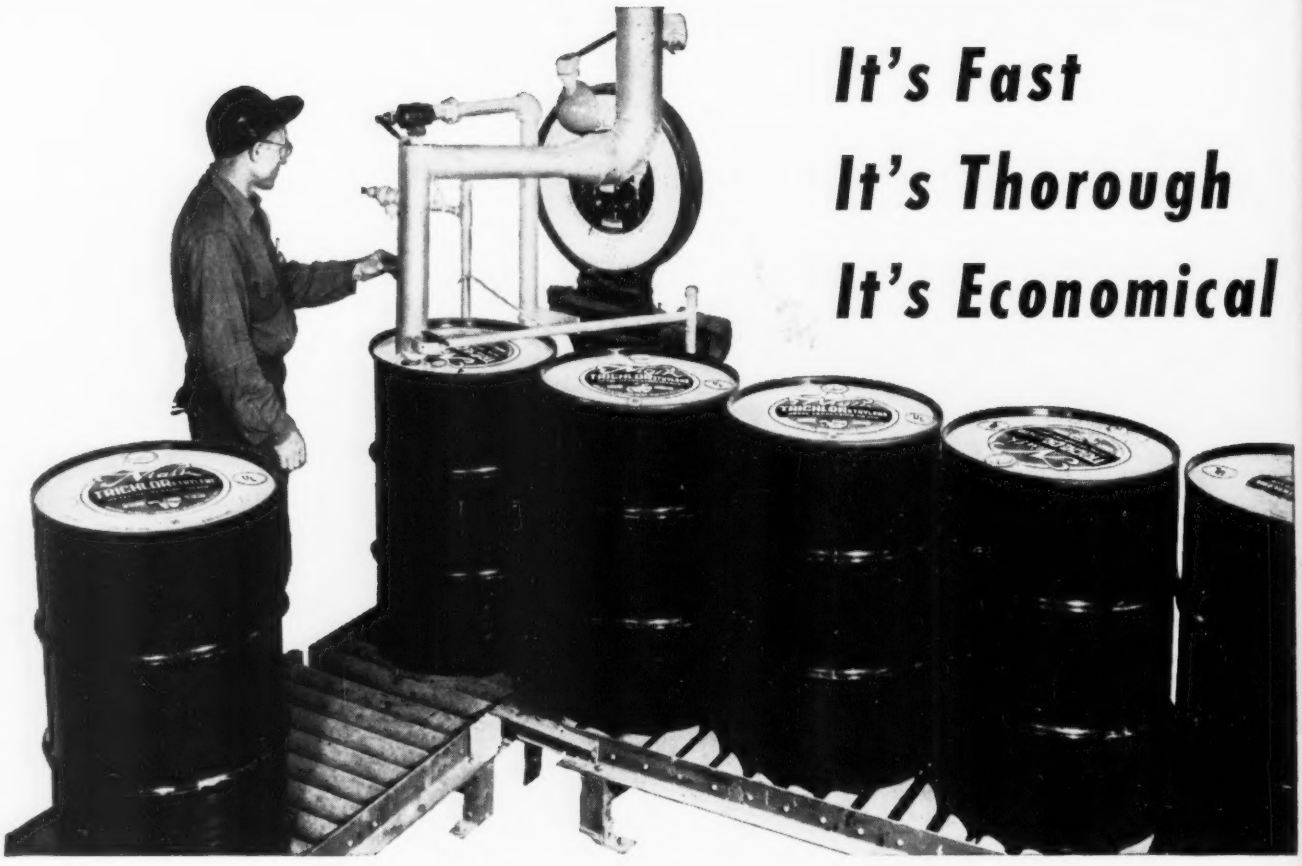
pH Papers

True Brite Chemical Products Co., Dept. MF, Oakville, Conn.



Oxyphen pH Papers provide a new and simpler method of testing pH rating of electroplating solutions. No separate color charts or comparison charts are needed with the new type papers which provide an instantaneous reading of the pH rating when the color of the indicator bar is compared with the nearest constant color bar.

Thirty separate ranges are available to cover all of the practical conditions of pH



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It's Thorough
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Nialk® TRICHLORethylene

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Order by the drum, carload or tank car. Deliveries can be made promptly. A request on your letterhead will bring you a free copy of our Nialk TRICHLORethylene booklet.

NIAGARA ALKALI COMPANY

60 East 42nd Street
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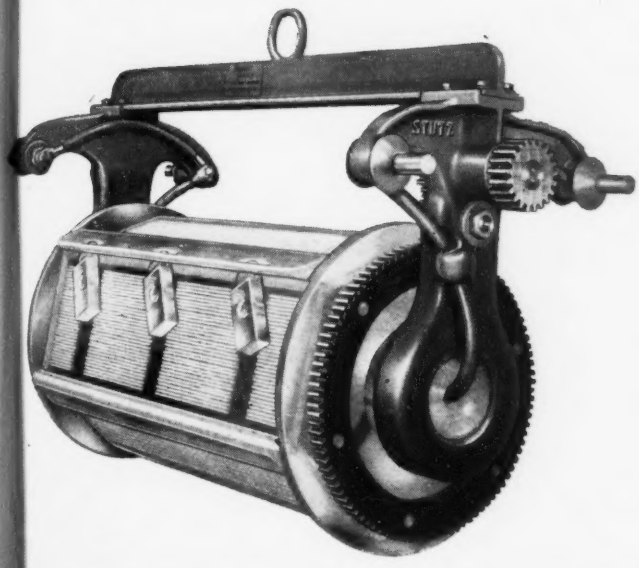
NIALK® Liquid Chlorine • NIALK Caustic Potash • NIALK Carbonate of Potash
NIALK Paradichlorobenzene • NIALK Caustic Soda • NIALK TRICHLORethylene
NIAGATHAL® (Tetrachloro Phthalic Anhydride)

STUTZ PLATING BARRELS of High Tensile PLEXIGLAS

for:

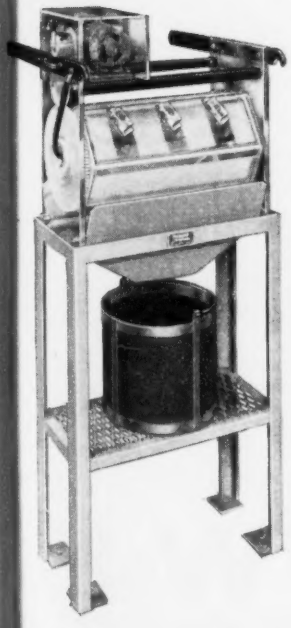
- **Heavy Duty Production**
- **Highest Possible Current**
- **Complete Cycle—all solutions (temperatures to 180°)**



Stutz Plating Barrel Unit for continuous operation through Alkali Cleaning, Acid Pickling, Acid and Alkaline Plating solutions and rinsing. Largest number of cylinder perforations possible.

Stutz Plating Barrel Unit, Motor Drive Mounted Overhead. Continuous rotation of cylinder from one operation to another and where a minimum of solution dragout is important. Roller bearing chain drive to absorb load shock. On a complete Barrel Plating installation, this type of equipment can be made at lower cost since motor drives are not required on each tank station. Sizes 12″x24″ to 18″x42″ I.D.

DELUXE PORTABLE PLATING BARREL

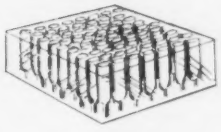


Made in 2 standard sizes.

Also smaller and with partitions.

Standard openings	3/32″
6″ x 12″ I.D.	$176.50
8″ x 18″ I.D.	$275.00
Stand (for either size)	$ 37.50
Basket (for either size)	$ 8.65

On inquiry specify whether production or portable barrels are desired.



PATENTED DUAL HOLE

Where extremely small openings are required, our patented Dual Hole is used. This design permits solution flow with a minimum of resistance.

5″ CYLINDER BEARINGS

Cylinder bearings 5″ diameter for heavy duty service and maximum life. Trunions are retained with sealed-in stainless steel bolts. Replacement made quickly if necessary.

WRITE TODAY FOR OUR NEW COMPLETE 1955 CATALOG. JUST OFF THE PRESS.

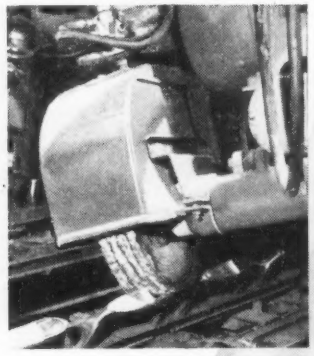
GEORGE A. STUTZ MFG. CO.

4430 CARROLL AVENUE • CHICAGO 24, ILLINOIS

"Complete metal finishing equipment and supplies"

Serving Industry for 35 Years

ALWAYS FINISHES FIRST



and cuts costs two ways because it's completely automatic!

fast cutting, easy cleaning with

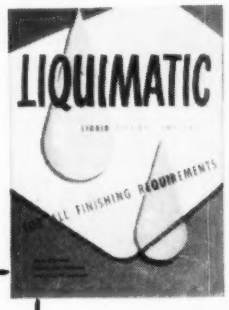
Liquimatic®

the perfect liquid compound for all metal finishing

What are the two big cost factors in your buffing room? Chances are *buff life* figures big when you're talking production costs . . . and the second big factor is *production time* itself. Liquimatic Application Systems are licking these two cost problems in buffing rooms all over the U. S.—because Liquimatic is automatic. An electrically timed system feeds Liquimatic Buffing Compound to the buff in the exact amount to give you the exact cut you need. Because the buff is continually lubricated, buff life is extended up to 400%!

And with Liquimatic there's no compound wasted, no nubbin problem, no hand application, no changing bars—think of the cost savings you can effect in *your* buffing room with these advantages! Savings in buff life alone can soon pay for a complete Liquimatic Application System . . . a system that will continue to save you money – *automatically*.

Check the other features of Liquimatic Buffing Compound . . . then write today for your free copy of Liquimatic's big, new folder that tells the whole cost-saving story of Liquimatic in *your* buffing room.



These additional Liquimatic features mean real savings in terms of time, money, safety—

- longer buff life
- completely automatic
- fast cutting
- easy cleaning
- non-settling
- high flash point
- long storage life
- sprayable viscosity
- adhesive slow-wearing buff face

Liquimatic *. . . gives more buff mileage*

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING COMPANY

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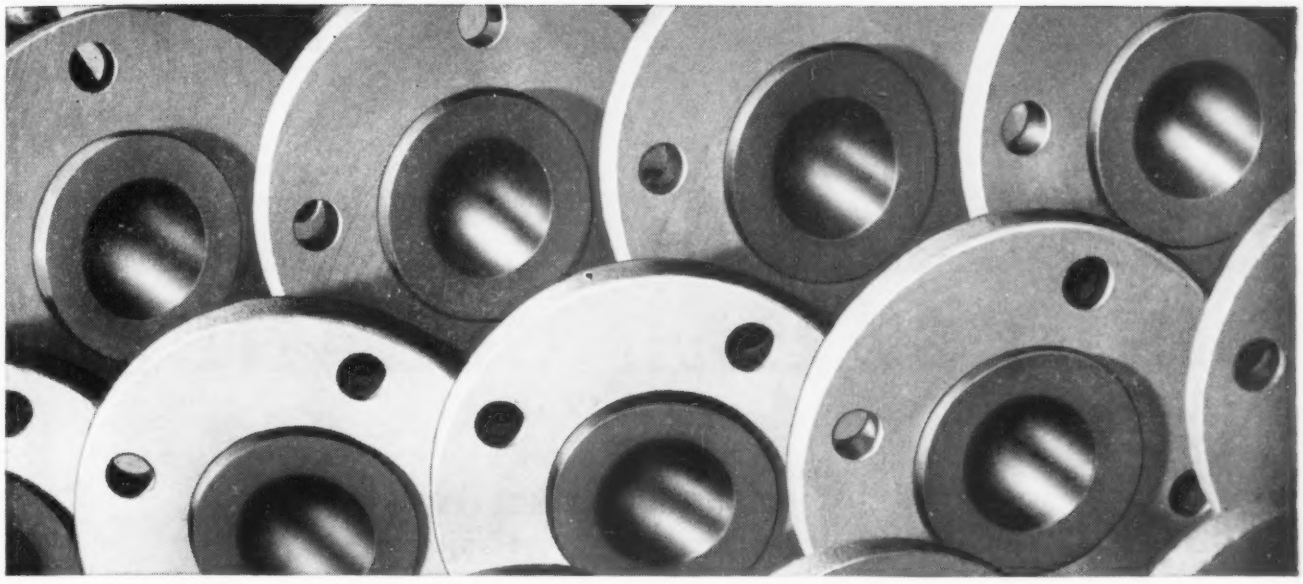
H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

DOW



You can see why

SARAN LINED PIPE

GIVES LONG, TROUBLE-FREE SERVICE

It's made of corrosion-resistant saran pipe swaged into steel for extra rigidity and strength . . . cuts downtime losses conveying corrosive liquids.

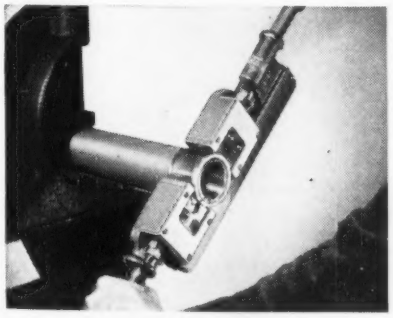
Now you can convey chemicals and many other corrosive liquids without worrying about costly shutdowns due to corrosion. For saran lined pipe, fittings and valves are corrosion-resistant . . . form snug, leakproof joints . . . which won't burst up to 150 pounds working pressure.

They're easily and inexpensively installed because they can be cut and threaded in the field with any standard pipe fitter's tools. Their rigidity means that few supporting members are needed.

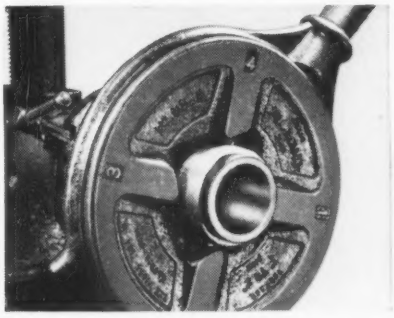
Saran lined pipe, fittings and valves have a proved record in industry of bringing long trouble-free service. If your operation requires superior resistance to most chemicals and solvents, be sure to investigate saran lined pipe. Contact the Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale 20, Michigan, Department SP527-C-1.

RELATED SARAN PRODUCTS—Saran rubber tank lining • Saran rubber molding stock • Saran tubing and fittings • Saran pipe and fittings.

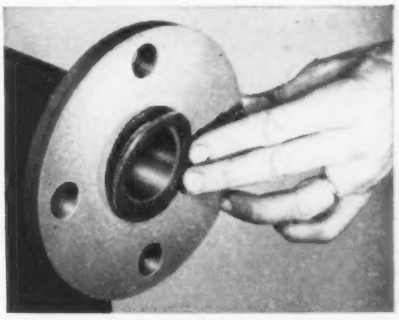
Saran Lined Pipe Can Be Fabricated Right in the Field!



An adapted Beaver Cutter cuts away the end of the steel pipe so that 3/16" of the saran lining is extended. This assures a tight seal after a flange is applied and connected with another flange.



A ratchet type thread cutter makes the standard threads after the Beaver Cutter has been used. A flange or union fitting is attached and tightened until the liner is flush with the fitting.



If two flanges, or a union fitting, are used to make a pipe connection then a full gasket is required. If a flange is made up against a flange fitting or spacer then a half gasket is required.

Saran Lined Pipe is Manufactured by
The Dow Chemical Company, Midland, Michigan

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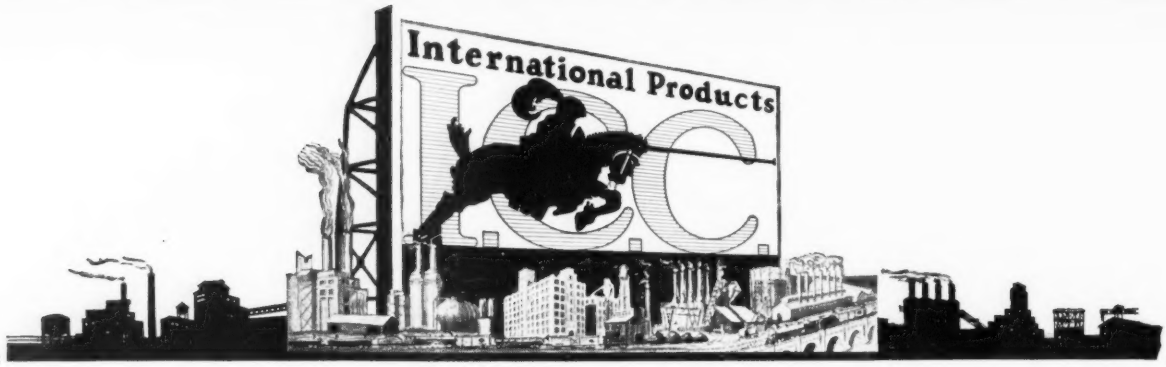

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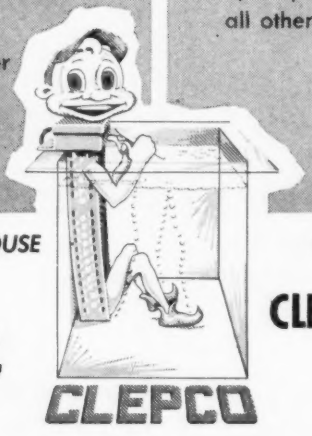

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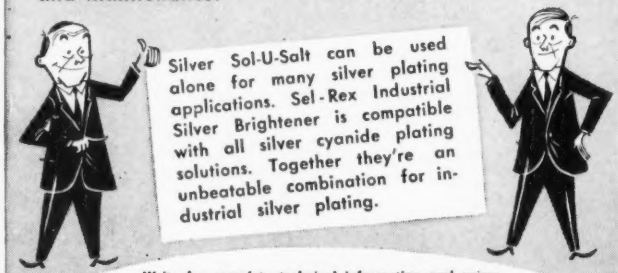

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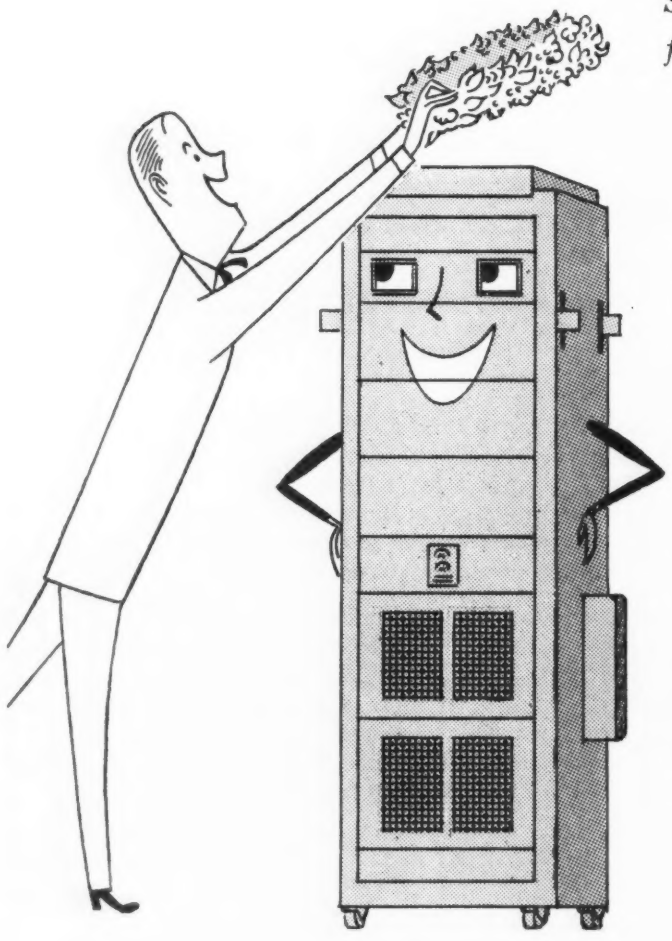

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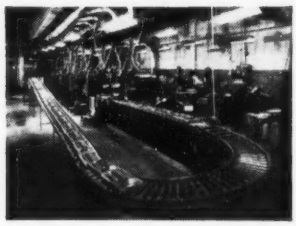

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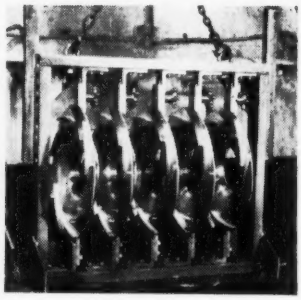

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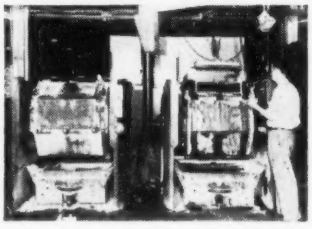

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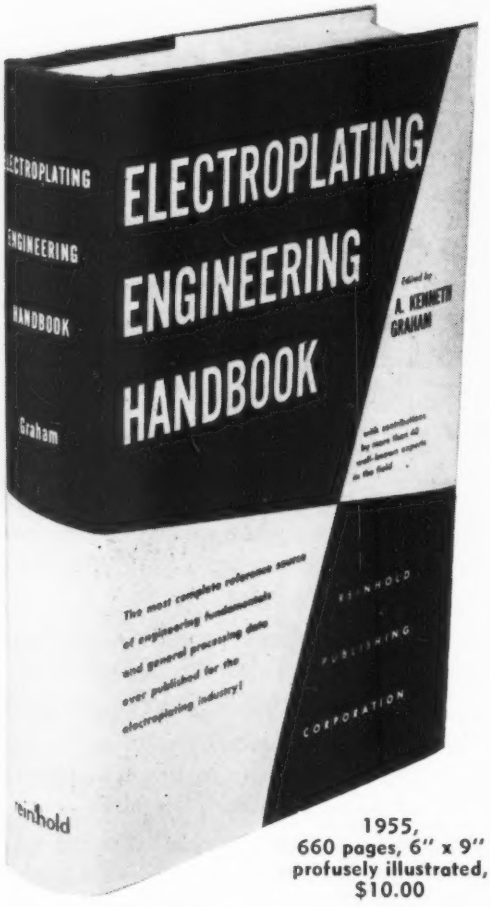

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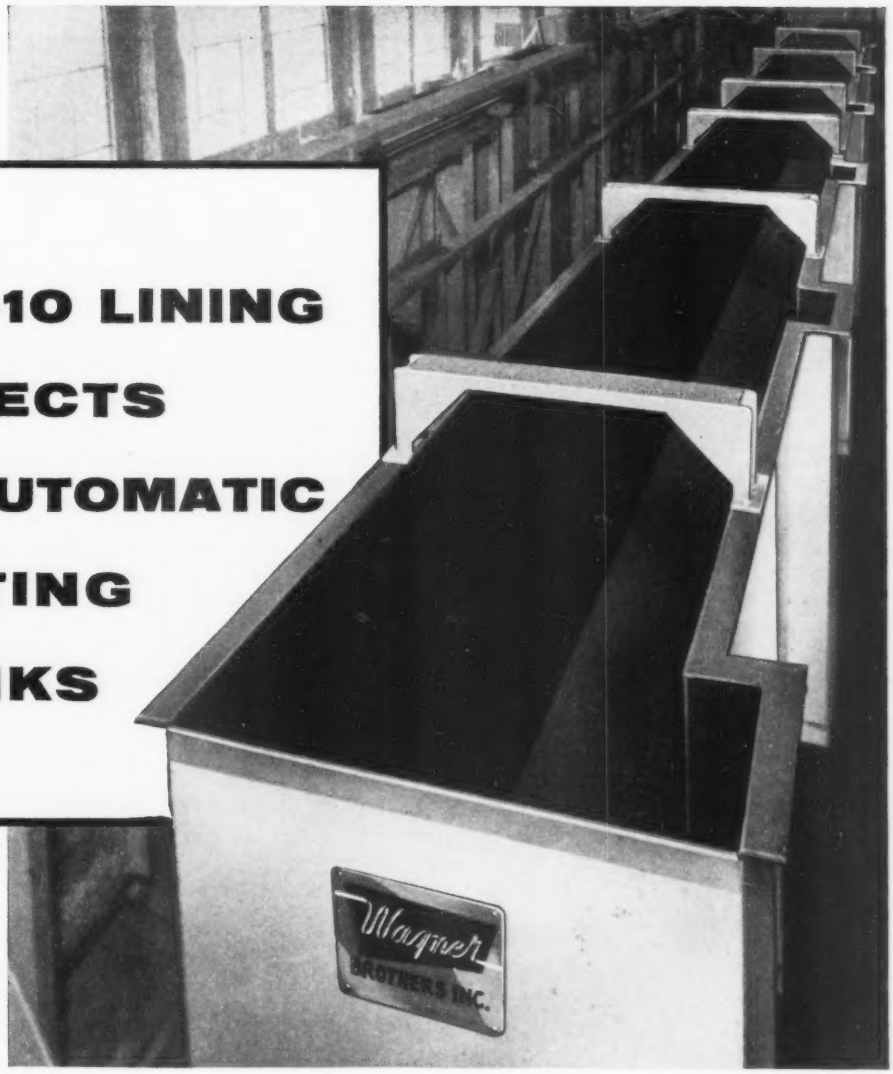

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The use of potassium oxalate as a complexing agent in the boric acid analysis in nickel solutions.

An article offering solutions for the problem of porosity in the basis metal will appear soon.

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Where Is the Nickel?

We have not encountered a single verified case in which a manufacturer or job plater was forced to discontinue operations as a result of the nickel shortage, but the supply situation could by no means be called favorable. Platers have been exercising considerable care to stretch their allotments by conservation measures, all the while in expectance of some relief which still doesn't appear to be forthcoming to any noticeable degree.

Spirits were buoyed up in the past by the announcements of increased production by The International Nickel Co. and the entry into the field of new producers, including the Nicaro Nickel Works in Cuba and both Falconbridge Nickel Co. and Sherritt Gordon, Ltd. in Canada. In addition, French and Japanese nickel, originating in New Caledonia, was known to be entering the American market, although this latter source accounts for less than 1% of shipments. Nickel consumers consider that they have benefited little, if at all, by all this increased production and the question predominant in their minds is: "What is happening to all this nickel?" Troubling them also are the rumors making the rounds that their allotments would have been increased, were it not for diversion to large new facilities recently installed by the automotive industry and a few others.

One would have to be exceedingly naive to expect allocations to be absolutely equitable, either with or without Government controls. However, from a practical standpoint, diversion of supplies could really be considered insignificant. The Business and Defense Services Administration has scotched the rumors by an investigation which revealed that nickel supplies for these large installations come largely from the French and Japanese shipments, which are available only at a premium of about 25-35¢/lb., as well as from recast secondary nickel.

It has been estimated that consumption of nickel for plating during the year 1954 was about 10% greater than for 1953, despite the fact that supplies were about 10% less due to increased Government acquisition for the stockpile. Nickel consumption by the military had been declining and it had been expected that there would be increased availability for non-defense uses in the coming months. Unfortunately, this trend has recently been reversed.

Despite release of 3 million pounds of nickel, which had been earmarked for the stockpile, the supply for non-defense uses will probably be less in the next quarter because of an increase in defense orders in April. Platers, therefore, needn't go to the trouble of demanding an explanation from their suppliers. They will be fortunate if their allotments aren't cut still further.

Nathaniel Hall

Standardization of Chromium Bath Tests On a Bent Cathode in the Hull Cell*

By Robert H. Rousselot, *Electrolysis Laboratory, French National Center for Scientific Research, Paris*

Introduction

THE formation of a metal deposit is governed by numerous and very complex factors. However, these factors can be divided into three different classes — corresponding to three distinct phases of the depositing process — and they can be briefly described as follows:

1. GEOMETRIC AND ELECTRICAL FACTORS:

This group of factors determines the properties and the geometric form of the field created between the anode and the cathode. In other words, they involve essentially the shape and arrangement of the anode and the cathode. It is due to these factors that a clearly defined current density, known as the *primary current density*, exists at all points on the cathode. (We know, for example, that a protruding part of a cathode will get more current than a recessed part.) This distribution of the current is called the *primary current distribution*. In some simple cases, it can be obtained directly by calculation. However, in the majority of cases, it is impossible to calculate.

2. CHEMICAL AND ELECTROCHEMICAL FACTORS:

This group of factors involves chiefly concentration (reduction of the concentration of metal ions in the catholyte) and chemical polarization (dehydration and discharge of ions, crystallization, and growth of the crystals). These factors lower the current density, which then becomes the *secondary current density*. This current density plays the most important part in the plating process, since it is the c.d. that actually exists in the electrolyte at every point of a particular specimen in a given anode-cathode arrangement.

3. CATHODE EFFICIENCY:

Only a part of the secondary current is used to deposit the metal. The remainder serves for the liberation of hydrogen (depending on the relationship between the metal and hydrogen in the electromotive series) or for the production of secondary reactions. The part of the current corresponding to the metal deposited, or *effective current density*, is therefore lower than the secondary current density. The relationship between these two factors determines the cathode efficiency. This efficiency also varies with the secondary current density, and this variation is one of the causes of a relatively good or poor distribution of the electrodeposit for a particular secondary current distribution.

Electroplating solutions have two quite distinct characteristics:

1. The minimum current density at which the deposit will start to form (which, in practice, means that any points on the specimen having a lower current density than this minimum will not be plated).
2. The ability of the solution to distribute the deposit more or less evenly between the points of high and low current density: in other words, the ability of the solution to produce metal thicknesses which either reduce or increase the differences presented by the current densities at various points.

These two characteristics, called respectively *covering power* (C.P.) and *throwing power* (T.P.), are often confused.

COVERING POWER IN CHROMIUM PLATING SOLUTIONS:

In many kinds of solutions the covering power is low and it is of little practical value to measure it. However, in chromium plating solutions, the C.P. gives evidence of three particular characteristics, which are mainly responsible for the troubles encountered in the chromium plating trade:

1. The C.P. value is comparatively high, which may result in no deposit at certain points.
2. It varies, depending on the base metal, its surface condition, and its preparation before plating.
3. It varies greatly according to the composition of the solution and the operating conditions.

A systematic study of all variations of covering power in chromium plating solutions, in relation to all these factors would, therefore, be impracticable and hardly worthwhile, because no practical case would find its exact equivalent among the numerous cases studied.

Nevertheless, the problem can be solved by devising a way to measure the covering power. This method will make it possible:

1. To measure the covering power in each case, taking into account the metal to be plated, the surface treatment, the operating conditions, etc.

*A paper presented at the Annual Conference of the French Hard Chromium Platers' Association, Paris, May 21, 1954.

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2. To determine, from results obtained, the maximum and minimum variation limits which can be tolerated for the C.P. value and keep the solution within these limits.

This paper will therefore be divided into two parts:

Part I—The development and standardization of a method to evaluate the covering power.

Part II—A study of the C.P. variations under simple conditions, given as an example.

PART I.

Development and Standardization of a Method to Evaluate Covering Power

Since the C.P. is evidenced, as we have said, in the places on the specimen where current densities were low, those who first studied this factor were led to devise a plating specimen whose shape provided areas intended to receive very low current densities.

The best known type of testing specimen is undoubtedly the small L-shaped piece devised by Sizelove in 1928.[1] Pinner and Baker[2] later used this same form to estimate the covering property of chromium plating solutions and, since that time, this test has been standard practice to check the covering ability of solutions and modify the CrO_3/SO_4 ratio to obtain best results.

PINNER AND BAKER'S METHOD:

Without describing their experiments in detail, it is interesting to recall the essential points of Pinner and Baker's method, because few platers observe them.

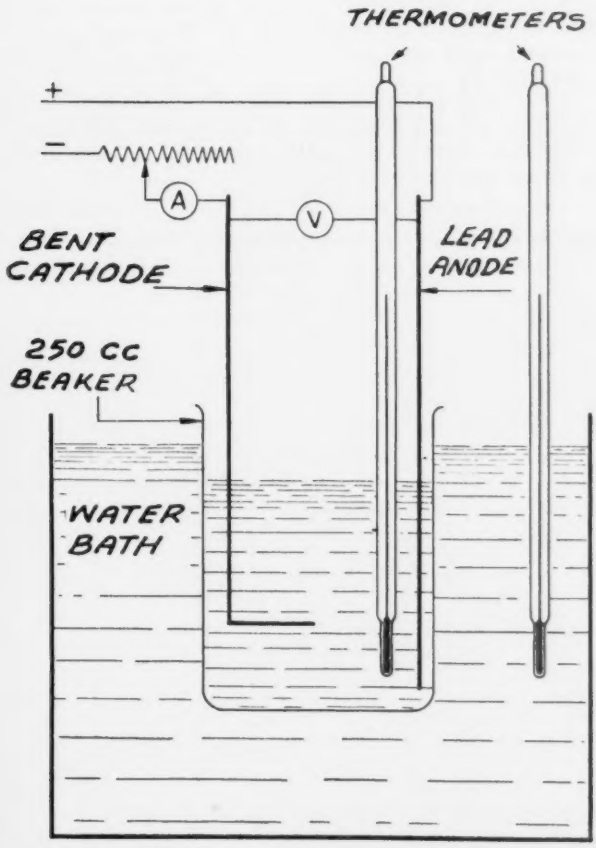


Figure 1. Design of test with bent cathode as given by Pinner and Baker.

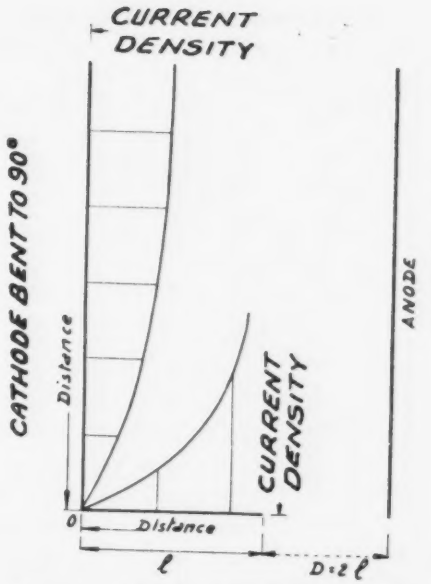


Figure 2. Current distribution on cathode bent to right angle according to Kasper.[3]

A beaker of 250 cc. capacity containing 200 cc. of solution is placed in a water-bath (Fig. 1) and the temperatures of the solution and of the water-bath are controlled by means of two thermometers. A lead anode 38 mm. wide and 3 mm. thick reaches to the bottom of the beaker along the side immediately opposite the cathode. The cathode consists of a copper strip 25.5 mm. wide and 0.25 mm. thick, bent at a right angle 25.5 mm. from its lower extremity and immersed over a total length of 63.5 mm., which means an immersion depth of 38 mm.

Chief criticisms of this method, are as follows:

1. The distance between anode and cathode is not definitely determined (although it is conditioned by the width or diameter of the beaker).

2. The fillet radius at the apex of the angle has not been taken into consideration.

3. Current distribution on the vertical and horizontal planes, respectively, of the cathode has not been put to advantage, so that the method is exclusively qualitative. This distribution would be as shown in Fig. 2, provided that the anode and the cathode were kept between insulating walls, regularizing the field (making it uniform along its width). It is obvious that current distribution on the vertical part of the cathode will tend to become more uniform the farther it is from the angle (anode and cathode parallel), while on the horizontal part it shows, on the contrary, a rapid increase (anode and cathode perpendicular to each other). The current distribution would therefore be of little value in any attempt to make the method quantitative.

4. Since the current lines are not regularized by the sides of the beaker, they enter the angle in the general direction of the bisecting plane, which gives the well-known lens-shaped form to the unplated spot. Since the test is usually made with a cathode of indiscriminate width in a beaker of any size (or else in the bath itself), the dimensions of this spot are in proportion to the width of the cathode and the free space around it.

Tests have now been conducted on small cathodes

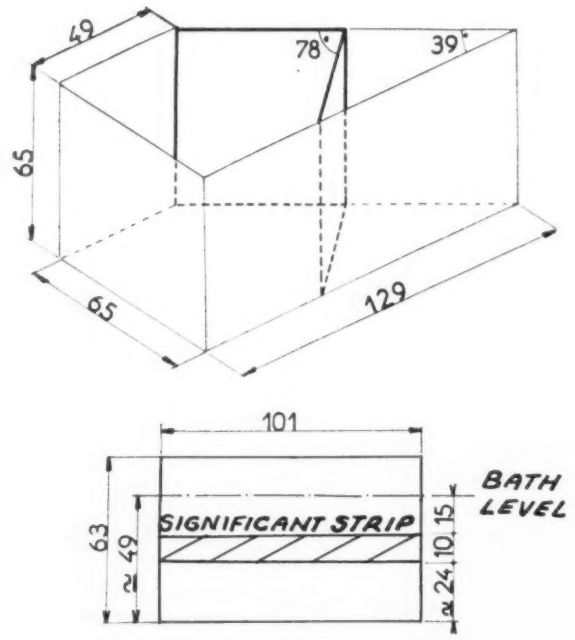


Figure 3. 270 cc. Hull cell with bent cathode, showing significant strip on the cathode.

bent at an angle of 78° (see later remarks concerning this angle) and of increasing sizes, placed symmetrically in relation to the anode and to the walls of a parallelopipedic cell of constant section. The results of these tests, summarized in Table I, show that the unplated portion increases with the size of the cathode, up to the point where the cathode occupies the entire section of the electrolyte.

THE HULL CELL:

In the effort to perfect a test method producing a wide range of current densities on a single cathode, Hull[4] devised a cell of 270 cc. capacity,* using a slant cathode (Fig. 3) and experimentally measured the distribution of the current along it.

The advantages of this method, in addition to the fixed dimensions of the cell (and consequently the standard form of the field), derive from some very interesting experimental conclusions which may be summarized as follows:

1. The secondary current distribution is practically independent of the type of bath used, and the calibration curves therefore hold good for all baths.

2. These curves (Fig. 4) are logarithmic functions of the distance measured from the left edge (the nearest to the anode) of the cathode.

3. These curves are homothetic by their ordinates in a proportion equal to that of the total intensities, making it possible to derive a single equation for these curves, valid from 2.4 cm. approx.:

[1] $i = I(3.96 - 3.88 \log x)$ *

where i = current density in A/dm² at a given point M on the cathode

I = total current in amperes

x = distance in cm. from point M to left edge of cathode

In this way, the Hull cell provides an excellent method for the quantitative evaluation of current densities on the cathode. However, in chromium plating baths, the point where the deposit begins — in other words the C.P. value — cannot be determined with the desired precision. This point is situated, in fact, near the right edge, where the proximity of the cathode and the wall prevents a good reproductibility in actual practice.

It was therefore advisable to combine the advantages of the slanting cathode and the bent cathode, while at the same time avoiding all the disadvantages inherent in these two methods. Consequently we have taken the Hull cell as our standard cell, chiefly because of its fixed dimensions** and its widespread use, and inserted into it a bent cathode with well-defined specifications (See Fig. 3).

BENT CATHODE IN THE HULL CELL:

No change in the cell itself was necessary. It was sufficient to bend an ordinary cathode, 101 x 63 mm., at the middle, parallel to the shorter sides, and install it as shown in Fig. 3.***

*The original capacity of this cell was actually the equivalent of 267 cc, but in converting to the metric system, we have preferred to use the figure 270, because the reciprocal of 0.270 is 3.70, which facilitates the g./l. conversion of additions made directly in the cell.

*Cf. Appendix II, Note 1.

**The conversion of the dimensions to millimeters induced us to make very slight changes, which do not affect the characteristics of the cell. The dimensions given in Fig. 3 are the *inside* dimensions, with the use of a 3-mm anode and a 1-mm cathode, approximately.

***It would have been easy to construct a special cell designed for the form of the bent cathode. The author's purpose, however, was to offer a new application of the Hull cell, which is already widely used.

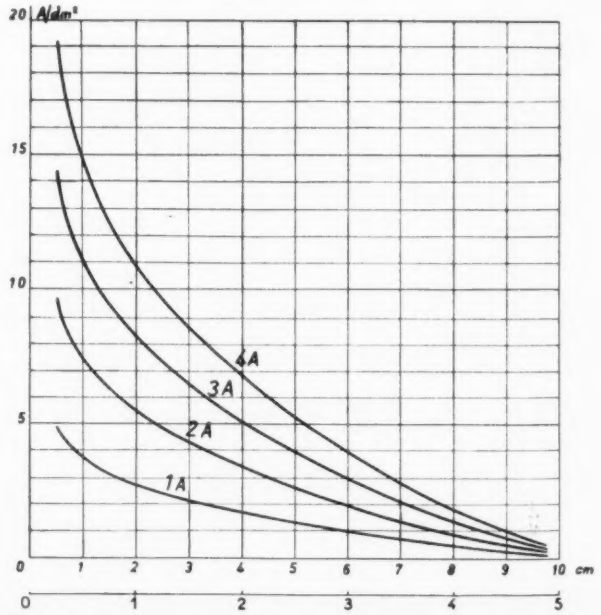


Figure 4. Curves representing current distribution along a straight cathode (first reference line) and on a bent cathode (second reference line) in Hull cell.

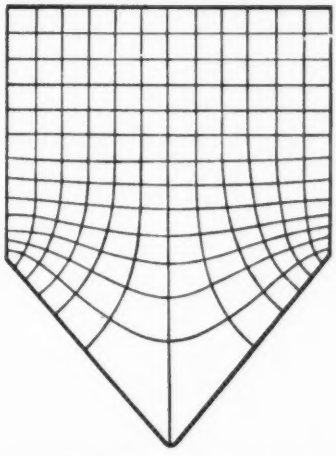


Figure 5. Field created between anode and cathode bent to 78°.

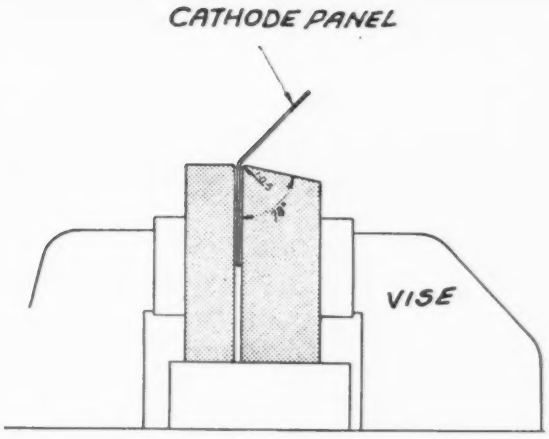


Figure 6. Method of bending cathodes.

The angle at which the cathode is to be bent is defined by the dimensions of the cell itself. This angle is 78°. A tolerance of ± ½ degree can be admitted, however, depending on the particular cell available.

Fig. 5 shows the form of the field created between the anode and the bent cathode. This field is, of course, symmetrical in relation to the bisector of the angle. It will be seen that the lines of current produce a highly density on the ends, but a very low current density in the apex of the angle. If the two sides of the cathode met sharply, the current density would become almost zero.

It was then only necessary to determine the fillet at the apex of the angle and to ensure satisfactory reproductivity of the bending.

Kronsbein,[5] in his effort to determine the minimum connecting radius of two perpendicular surfaces, beyond which one should not manufacture parts for plating, reached the following conclusions: the fillet radius has little effect on the thickness of the metal deposited inside the angle and on the two sides provided that it is at least equivalent to 0.5 mm. for 50-mm. sides. This same figures was used, therefore, for the fillet, in spite of the fact that our angle is somewhat more acute.

The method of bending the cathode is shown in Fig. 6. By placing a sheet of thin tissue paper between the polished surface of the piece and the block machined to 78°, and then hammering the piece with a mallet over the hip of the block, good results can be obtained with a little practice.

Determining the Current Distribution:

The fixed angle and fillet, together with the fixed dimensions of the cell, ensure the qualitative standardization of our test.

In order to make the test quantitative, it is only necessary to determine by experiment the distribution of the current along the shanks of the cathode.

This was done by using a copper fluoborate bath. This solution, in fact, has almost zero polarization and 100% cathode efficiency up to very high current densities, unlike the acid copper sulfate plating bath used in coulometers. Consequently, with this bath, the primary, secondary, and effective distributions are all identical, or at least they are sufficiently similar so that this bath can be considered as the ideal one for the purpose.

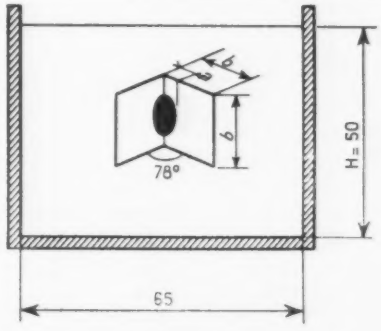
(*Continued on page* 55)

TABLE 1

Variations of unplated percentage with ratio:

$$\frac{H}{b} = \frac{\text{depth of electrolyte}}{\text{width of cathode}}$$

a/b, %	H/b
10	5
18	3,1
22	2,3
26	1,5
31	1,3
36	1



Solution CrO_3 — 250 g/l
SO_4H_2 — 2,5 g/l
Cr_2O_3 — 0
Fe — 0
Temp. 35° C.
C.d. 8 A/dm²

Spotting-out and Staining on Plated Work

A Simple Test for Eliminating One Cause

By G. B. Hogaboom Jr.

IT is not an uncommon experience to finish metal articles with a clean, uniform cadmium, brass, or other plated coating and then to discover several days later that unsightly spots or stains have developed. In many cases the plating solutions are blamed for these defects and the remedy commonly offered is to rinse more thoroughly so as to remove the final plating solution from the pores.

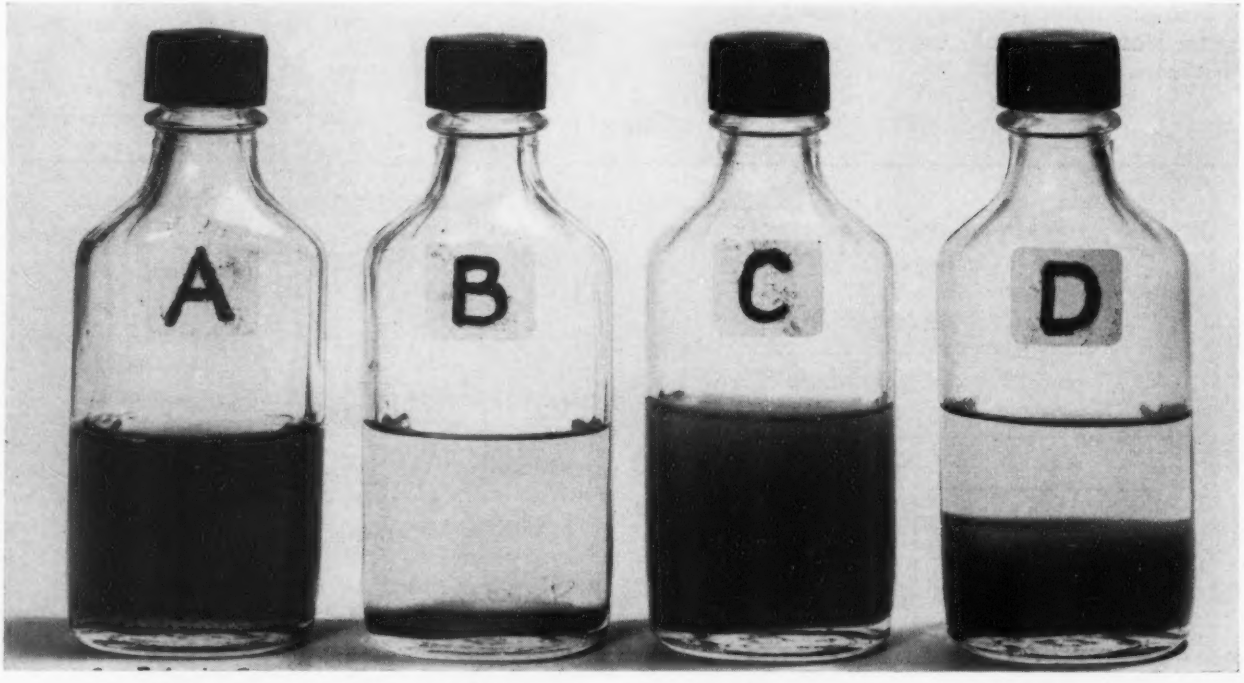
The purpose of this article is to draw more attention to the fact that the cause of spotting often originates in the preparation of the article before plating. For example, if there is any sequence of solutions used in the preparation that will cause an insoluble precipitate to form in holes, lap seams, crevices, and so forth, a condition is being set up that will cause trouble later.

Precipitated material can form between pieces of work which nest, also under leaky stop offs, and cause stains that are often blamed on the "plating." The damage has occurred before the work gets to the plating tank.

When the article is plated, the deposit may partially cover over such precipitates but will seldom cover them completely with a perfectly impervious coating. The result is that, when the finished article has been exposed long enough, the precipitated material picks up moisture which dissolves some of the entrapped salts. There is thus created a miniature spring that will slowly exude a stain forming juice. As the outer edge of the ring of exudation dries, crystals or salts are formed. These solids act like blotters and draw more moisture from the "spring." The wet crystals cause further advance of the staining. Though the original spot is small the effect is unhappily conspicuous.

A simple test to determine if precipitate forming action exists in the cleaning line is to take a small portion (say 1 fluid ounce) of any solution in the cleaning line in a beaker or bottle. To this slowly add solution from the tank that is next in the cycle (not counting rinses). Of course, if cyanide solutions are involved, do any mixing near an exhaust blower.

If a large addition of the second solution can be made to the first and the mixture remains clear, that's



Cleaner Acid Dip Mixed Settled

good. If cloudiness or a heavy precipitate forms, then a similar precipitation can occur in porosity or lap joints in the work. A precipitate that forms, and then redissolves on further addition, still presents an undesirable condition. The redissolving cannot always be counted on under production conditions.

Cyanide or acid dips that have built up in metal are often at fault. A cyanide dip with dissolved metal will have a precipitate produced by a subsequent acid dip since neutralizing the free cyanide causes the insoluble metal cyanide to appear.

An acid dip containing dissolved metal will have metal hydroxides precipitated by a subsequent cyanide dip.

Cleaners low in caustic and containing silicates or soaps (either added originally or formed in use) will have gelatinous insoluble silicic acid, or metal soaps, precipitated when the porous article is acid dipped. Insoluble precipitates can also be formed when the work enters the plating tank. The "precipitate test" should, therefore, also be made with the plating solution and the preceding dip.

It is frequently impossible to avoid a procedure that will cause precipitation. A common example is a brass casting requiring a bright dip, cyanide copper flash and nickel plate. The metal content of the bright dip will be precipitated by the cyanide. The easiest remedy here would be to avoid the acid dip - cyanide dip - nickel plate sequence by using a muriatic acid dip instead of the cyanide dip, and nickel plate directly. Then all solutions are on the acid side. If this cannot be done, next best procedures to consider are:

1. To allow more time in the rinses by leaving the first rack or basket of work to soak until the next one is brought up. Air agitation in the rinse by compressed air or water line aerators will help. Or introduce water to the rinse tanks from 2 or more small cocks to get velocity, rather than from one large pipe.

2. Do not use the same rinse for two precipitate forming solutions. (If rinse water gets cloudy that's the warning.)

3. Use a wetting agent solution dip before a rinse to aid in penetration of pores. This dip, as well as rinses (if possible) can be run warm for difficult cases.

4. Keep the strength of any precipitate forming dip as low as possible and use the shortest immersion time that will do the job.

An extreme case of stain producing conditions is illustrated by the photograph. The commercially used cleaner, shown in Bottle A, was used as a first rough cleaner. It was seldom renewed — just added to — and was loaded with soaps, silicates, and dissolved metal. Bottle B contains the acid dip, loaded with dissolved metal. When a little acid is added to the cleaner a heavy mud forms as in bottle C. The amount of mud is shown after allowing to settle overnight in bottle D. Even though following steps produce a clean metal surface, the damage done by the original precipitation remains in porosity, seams, etc.

STANDARDIZATION OF CHROMIUM BATH TESTS ON A BENT CATHODE IN THE HULL CELL

(*Continued from page* 53)

After cutting and measuring the thicknesses of metal with a metallographic microscope, the current distribution graph was drawn for a total current of 4 A,

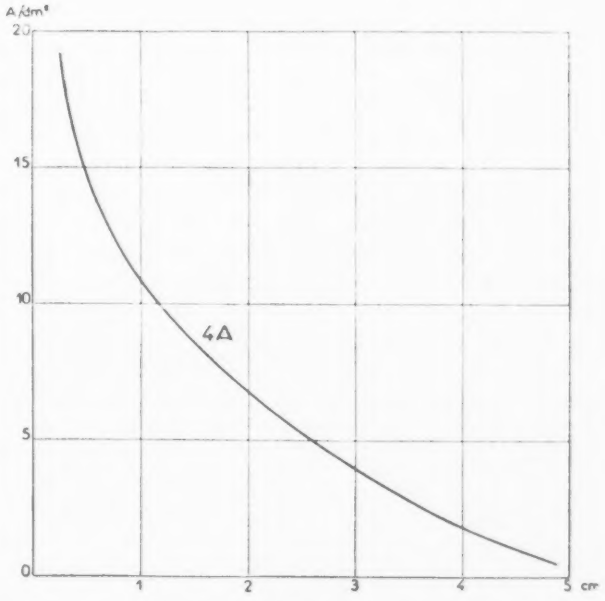


Figure 7. Curve showing distribution of current along bent cathode placed in Hull cell. (Only one-half of curve, 0 to 5 cm., is shown, the other half being symmetrical.)

and is shown in Fig. 7. The general equation, valid from 1.2 cm., is:

[2] $\quad i = I\ (2.80 - 3.88 \log x)$ *

A comparison of equations [1] and [2] gives rise to a number of remarks which are slightly beyond the scope of this paper and are given in Appendix II. The curves in Fig. 4 can be used for bent cathodes (using the appropriate horizontal axis).

The total current of 4 A was selected because it corresponds to an average current density of 8A/dm.² (the cathode surface being approximately ½ dm.²) commonly used in decorative chromium plating. The subject of total current will be discussed later.

To summarize Part I, the standardization of this test is limited to establishing the angle of bend: 78°, the fillet radius of the apex: 0.5 mm., the total current: 4 A and, finally, the duration of test: 3 minutes. In order to determine the covering power quantitatively, it is merely necessary to measure along the strip, here called "significant strip" (Fig. 3) the distance of the point where the deposit begins from the left edge of the cathode (or from the right edge if the point is selected on the right side). This method offers an additional advantage in that agreement of results will prove that the test has been correctly preformed.

*Cf. Appendix II, Note 2.

(*Part II will appear next month*)

Complex Ions in Chromium Plating Solutions

By Gunnar Gabrielson, *AB Tudor, Avdelning Harbeck, Partille, Sweden*

Introduction

IN recent papers, the ability of strongly acid cation exchangers in the hydrogen form to liberate the corresponding acids, when salt solutions are percolated through the resin layer in order to remove interfering ions, has been used for the determinations of the content of phosphate and accelerators in phosphate solutions,[1] the metal content of phosphate solutions[2] and the boric acid content in nickel plating and acid zinc plating baths.[3] It seemed, therefore, to be appropriate to use ion exchangers also in the analysis of chromium plating baths in order to remove interfering ions. As we know, chromium plating solutions always contain trivalent chromium and trivalent iron and, sometimes, small amounts of other metals, e.g. copper. In a careful determination of the chromic acid content in chromium plating baths, it is necessary first to remove these metal ions. This is usually done by precipitating these ions as hydroxides by sodium carbonate from the boiling solution and filtering off the precipitate. These hydroxide precipitates are very voluminous and very difficult to wash out. The hydroxides also make the filter papers tight with the result that the filtering time is very long. In order to get rid of these difficulties, it was considered convenient to remove these impurities by percolating a diluted chromium plating solution through a bed of a strongly acid cation exchanger in the hydrogen form, in which case the metal ions are exchanged against hydrogen ions according to the equation: $Me_2CrO_4 + 2\,RSO_3H = H_2CrO_4 + 2\,RSO_3Me$; in this equation Me denotes an univalent metal ion and RSO_3H the cation exchanger in the hydrogen form. After washing with distilled water, it ought to be possible to determine the chromic acid quantitatively in the combined effluent and wash water by titration with sodium thiosulfate in the usual way.[4] It should be possible to elute the metal ions retained in the resin layer with sulfuric acid and determine them in the eluate in an appropriate way. This method was also tried as described below. For general directions regarding the use of ion exchange resins in analytical chemistry see reference (5).

Apparatus

The experiments have been performed with a cation exchanger of sulfonic acid type, Amberlite IR-120. The particle size of the resin was 0.20-0.49 mm in the air dry condition. The ion exchange columns used were of ordinary type as described in the literature.[5] The height and diameter of the resin layer were 150 mm and 10 mm respectively in all experiments described in this paper. The ion exchanger was transformed into the hydrogen form by passing 100 ml 3N hydrochloric acid through the column and subsequently washing with water (about 150 ml) until neutral reaction of the filtrate was obtained. The flow-rate was about 2 ml per min. during regenerating and washing.

Preliminary Experiments

Chromium plating baths which had been analyzed in the usual way (i.e. by precipitating the interfering metals as hydroxides and determining the chromic acid content in the filtrate) were also analyzed with regard to the chromic acid content by means of the cation exchange method outlined above. 10 ml of the chromium plating solution were diluted with distilled water to a volume of 100 ml. Of this dilute solution, 10 ml were percolated through the cation exchange layer. Afterwards, the resin bed was washed with 50 ml distilled water and the amount of chromic acid in the combined effluent and wash water was determined through titration with 0.300N sodium thiosulfate solution. The results are shown in Table I, from which it is seen that the chromic acid content determined after the ion exchange passage is considerably lower than the amount found by the usual method.

TABLE I

Solution No.	*Chromic acid content determined by ion exchange analysis*	*by ordinary analysis*	*Per cent relative error*
1	363 g./l.	394 g./l.	—7.9
2	400 g./l.	434 g./l.	—7.8

As it has been reported in the literature that cation exchangers have a tendency to retain chromate ions, the chromic acid adsorption on Amberlite IR-120 was investigated. A solution was prepared of very pure chromic acid and the chromic acid content determined through titration with 0.300N sodium thiosulfate solution. 10 ml of this solution were diluted to 100 ml with distilled water and 10 ml of the diluted solution passed through the ion exchange bed. After washing with distilled water, the combined effluent and wash water was titrated with sodium thiosulfate as described above. The results, which are seen from Table II, show that no adsorption of chromic acid occurs. This is in accordance with the results reported in recent literature,[6] according to which no adsorption of chromate ion oc-

curs on sulfonated hydrocarbon resins, to which class Amberlite IR-120 belongs.

TABLE II

Chromic acid content	
Directly	*After ion exchange passage*
387 grams per liter	387 grams per liter
	385 grams per liter

From the results in Table II it is evident that the decrease in the chromic acid content after the passage of the cation exchange resin, as seen from Table I, does not depend on an adsorption on the resin. As the chromium plating baths analyzed also contained trivalent chromium, it was thought possible that the chromium ions combined to complex compounds with the chromate ions, which were retained by the cation exchanger. This possibility was therefore investigated.

Complex Chromium Ions

As early as 1940 Samuelson[7] reported that, when a chromium sulfate solution was percolated through a cation exchange layer, part of the sulfate was retained in the column. On the other hand, a certain amount of chromium passed into the effluent. This means that part of the chromium and sulfate forms complex cations which are retained by the exchanger and that part of the chromium does not occur in cationic form. It was shown that the amount of sulfate retained in the column is dependent upon the flow-rate and the volume of the resin bed. Detailed studies of chromium complexes in basic chrome tanning liquors have been performed by Gustavson[8-19] and Adams[20]. Also, in these investigations the chromium solutions were analyzed by means of cation exchange resins. From these investigations it may be stated that, in chromium tanning liquors, several types of complexes of chromium with different ions exist, the complexes carrying different signs and numbers of charges, which make the whole very confusing. It was found that part of the chromium complexes are irreversibly fixed by the exchanger. In contradiction to the results reported by Samuelson, Gustavson found that variations of the chromium content and the flow-rate, within certain limits, did not affect the results appreciably. In his investigations, Gustavson generally used the hydrogen form of the resin but, in later papers, he prefers the sodium form.

In recent time, the chromium-sulfate complexes in chromium plating baths have been studied by means of cation exchangers, radioactive chromium being used in these investigations.[21] It was found that sulfate was retained in the column and that it was not possible to recover quantitatively the chromium in the exchanger, in accordance with the results presented above.

Experimental

As is seen from the above, chromium and sulfate ions have a strong tendency to form complex compounds. Also, with other negative ions, trivalent chromium forms complex compounds, which is reported by Gustavson. It was therefore deemed possible that trivalent chromium and chromate ions give complex ions analogous with e.g. chromium - sulfate complexes. In order to investigate this, the following experiments were performed. Using very pure chromic acid, chromium solutions were produced, to which varying amounts of very pure chromium sulfate was added. Of these solutions, 10 ml were diluted to 100 ml and 10 ml of these were passed through a layer of the cation exchange resin in the hydrogen form. Afterwards, the resin was washed with 50 ml distilled water. The flow-rate during the sorption and washing steps was 3-4 ml per min. The chromic acid content was determined in the combined effluent and wash water by titration with 0.300N sodium thiosulfate solution. In order to elute the adsorbed chromium ions, 50 ml 3N sulfuric acid was passed through the column. The chromium in the eluate was oxidized to chromic acid with hydrogen peroxide and determined through titration with 0.030N sodium thiosulfate solution. The results are shown in Table 3, from which it is seen that, with increasing amounts of trivalent chromium in the solution, more chromic acid is retained in the resin layer. It is also seen that the percentage of trivalent chromium not recovered increases with increasing amount of trivalent chromium in the ingoing solution. It must be mentioned that no trivalent chromium was found in the effluent, i.e. under prevailing conditions no uncharged or negative charged complexes were formed of trivalent chromium and chromate, and that no chromate was found in the sulfuric acid eluate.

TABLE III

Added		*Found*			
CrO_3 g./L.	*Cr_2O_3 g./L.*	*CrO_3 g./L. in combined effluent and wash water.*	*Per cent relative error*	*Cr_2O_3 g./L. in eluate*	*Per cent relative error*
387	8.6	367	—5.17	6.1	—29.1
387	17.2	357	—7.76	10.6	—38.3
387	25.8	351	—9.30	14.9	—42.2

Discussion

As is seen from the above, trivalent chromium forms complex compounds with chromate ions, which are retained by a cation exchanger in the hydrogen form, i.e. the complex compounds formed are very likely positively charged. This is in accordance with the complex ions formed between trivalent chromium and sulfate ions. The fact that stable, charged chromium complexes are formed in chromium plating baths is of great interest from the point of view of electroplating. Some of these aspects will be discussed below.

The mechanism of deposition of chromium from chromium plating baths has been discussed for a long time. Recently, however, this problem seems to have been solved,[22] by the use of radioactive chromium (Cr^{51}). Hitherto it was usually thought that the deposition of chromium occurred through reduction from the trivalent state. Ogburn and Brenner, however, found that, when tagging the chromium in either the hexavalent or the trivalent state with a radioactive isotope of chromium, the radioactivity of the deposit indicates that the metal is deposited from the hexavalent state and that the chromium originally present in the trivalent form is not deposited. This fact raises the question of how the hexavalent chromium is transported to the cathode, as the hexavalent chromium forms the nega-

tively charged chromate ion. From the results in this paper it may seem possible that the hexavalent chromium is transported to the cathode as positively charged chromium-chromate complexes. In an analogous way the sulfate ions may be transported to the cathode as positively charged chromium-sulfate complexes.

It is possible that this is the explanation of the effect of the addition of trivalent chromium to new chromium baths. As we know, trivalent chromium salts are added to new chromium baths as "catalysts." During the electrolysis, trivalent chromium is formed through reduction of hexavalent chromium by the hydrogen evolved at the cathode. Because of this, the trivalent chromium content tends to increase during electrodeposition and addition of chromium in the trivalent state is necessary only to new chromium-plating baths.

Also, from another point of view, the formation of positively charged chromium-complexes is of interest to the electroplater, namely the removal of interfering ions by means of cation exchangers. The interfering ions in chromium plating baths are usually ferric ions and an excess of trivalent chromium ions. Trivalent chromium should be present to an amount of 5-10 grams per liter. When the ferric ion content has risen to about 40 grams per liter and the amount of trivalent chromium to about 15 grams per liter it is necessary to reduce them. The trivalent chromium content is reduced by promoting its re-oxidation to chromic acid at low anodic and high cathodic current density. This procedure is rather laborious. When the iron content, on the other hand, has become excessive it has hitherto not been possible to remove it, and a new chromium bath has instead been necessary. In recent times, however, an entirely new method has been proposed in order to remove impurities from chromium plating baths, namely by percolating the solution through a bed of a cation exchange resin in the hydrogen form, when the following reaction occurs:

$$Me^+ + RSO_3H = RSO_3Me + H^+$$

Where, Me^+ is a univalent metal ion and RSO_3H the cation exchanger in the hydrogen form.

In this way the metallic impurities (iron and chromium) are removed from the solution. This process which, in principle, is very simple, has not been so successful hitherto, owing to the fact that ion exchangers usually are not so chemically stable that they can withstand the strongly oxidizing chromium plating solutions. Recently, however, it has been reported that a modified sulfonated hydrocarbon resin now is manufactured, which will withstand such concentrated solutions as chromium plating baths with 400 grams CrO_3 per liter.[23] It is therefore probable that this method of purifying chromium plating solutions will be very common in the near future. For the economy of this process, it must be very important to know if a certain amount of the chromate content is retained in the column. In the papers describing this procedure this factor does not seem to have been considered. As an example, it may be mentioned that Paulson and Saunders[23] describe two different ways of performing the regeneration of chromium plating baths by means of cation exchangers, the solutions used containing copper but no trivalent chromium as interfering ions. It seems to be a matter of great practical value to study an industrial plant in order to determine the loss of chromate owing to complex formation between trivalent chromium and chromate ions.

The model solutions used in the investigations reported above (see Table 3), also contained sulfate ions. The presence of these ions complicate the study to a certain degree, as, which is seen from above, trivalent chromium forms stable complex compounds with sulfate ions too. However, in this study, no investigation has been performed regarding a quantitative estimation of the amount of sulfate retained by the cation exchanger.

The author hopes to have an opportunity in the near future of performing a more detailed study of all the complexes occuring in chromium plating baths by means of ion exchangers.

Summary

1) It has been shown that, in chromium plating baths containing trivalent chromium, complex formation occurs between the chromium and chromate ions, resulting in complexes, probably positively charged, which are retained by cation exchangers in the hydrogen form.

2) Some consequences of this complex formation have been registered regarding the mechanism of chromium deposits and the purification of chromium plating baths by means of ion exchange resins.

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PLATING BATH CONTROL: Past, Present and Future

By Joseph B. Kushner, *Director, Electroplating School, Stroudsburg, Pa.*

EVER since commercial electroplating began one hundred and eighteen years ago in the small Birmingham shop of Elkington & Elkington, electroplaters have been looking for a plating bath that will turn out perfect work continuously, without any special attention. Just hang the work in and take it out. No peeling, no blistering, no spotting, no staining, no time out for purification, no doctoring, no analysis — no work. The plater's dream come true!

Of course, such an animal does not exist but the chase goes on and on because, deep down in every human breast, is a smoldering desire to get something for nothing. It can't be done — the laws of nature tell us that — but thermodynamics or no thermodynamics — we can keep right on trying, can't we?

The truth, if we want to face it squarely, is that we will never achieve this plating millenium with a particular composition of matter, no matter what the advertising men write. Every plating bath requires control in order to operate properly continuously, and control calls for the expenditure of energy and time by the plater. If we want to really fulfill this dream of ours we will have to substitute for our energy and time, that of a machine, mechanism, or electronic brain. Call it automatic control or what you will, this is the only direction we can go in order to arrive at our goal. All other paths are blind alleys.

Just what is this control chore we have been trying to minimize? We can define it simply as: *Maintaining an optimum set of conditions against forces that change the conditions.*

A beautiful example of automatic control is the centrifugal governor for steam engines invented many years ago by Watt. Tests showed that the engine gave its best performance when the flywheel rotated at a certain speed. Of course a man could manually open and close the valve from the steam box to the pistons so as to feed the right amount of steam to insure operation at the correct speed—and this was the case before the governor was invented. With some experience a man could no doubt do a fair job of it — but think of how erratic the results could be—think of how often the engine might have to be shut down for repairs because of a little human slip-up!

Watt solved the difficulty by designing a mechanical controller that did the job much better than any ordinary mortal could. As can be seen from Fig. 1, a belt driven by the flywheel operated this remarkably simple gadget which consisted of two weights suspended in such a way that they flew apart as they rotated about a common axis. When the speed of rotation increased they flew farther apart because of centrifugal action, throttling down the steam feed through a mechanical linkage; when the speed of rotation diminished, the weights dropped down causing the steam valve to open, which automatically sped up the engine. In this elementary way, the engine was controlled or governed to operate at its best speed, *continuously*.

Now it may be argued that a plating bath is a far more complex thing than a steam engine. It is. Nevertheless, by breaking down the complexity into simple components, it becomes possible to find "governors" for each of these basic elements which, when combined, will keep a plating bath operating at its peak for an indefinite period of time.

Consider the block diagram of a plating bath and the variables that effect it, as shown in figure two. The basic variables with which we have to deal are: 1. pressure; 2. temperature; 3. agitation; 4. time; 5. electrical energy; 6. composition (includes pH).

At the outset, pressure can be eliminated as a vari-

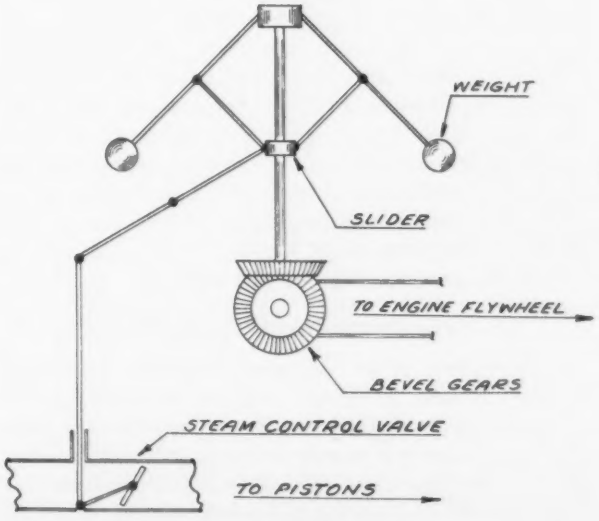


Figure 1

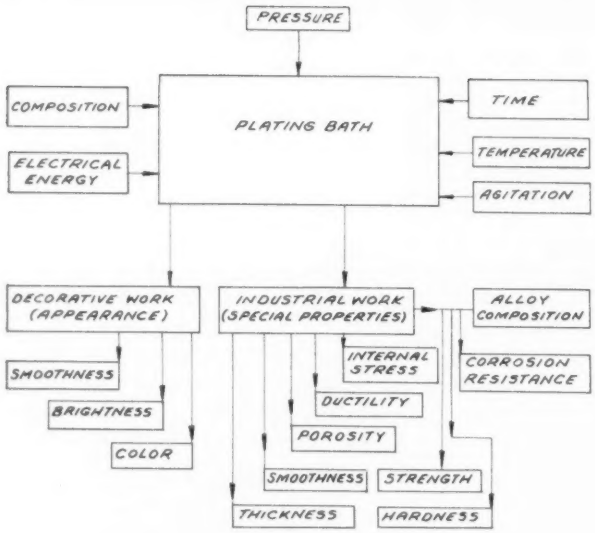


Figure 2

able because, with few exceptions, plating is normally conducted at atmospheric pressure and, as far as we know, even large variations in this pressure have no effect on the plating bath or the deposit. This leaves us with five variables which require governing or control.

Unfortunately these variables are not all completely independent of each other which would make the matter of control quite simple. They are interrelated in subtle ways, which makes the task considerably more difficult. And, to compound the complexity we don't always want the same result from a given plating bath, as will be noted by studying the diagram in Fig. 2.

For example, if we are doing decorative plating we are interested primarily in the appearance of the deposit — which has to do with the properties of brightness, smoothness and color. If we are doing industrial plating we may be interested in the thickness of the deposit, its smoothness, its corrosion resistance, its hardness, its strength, its porosity, its state of internal stress, its ductility or its composition (where alloys are deposited). Thus, our conditions must be adjusted in a given bath to produce what we are looking for in the deposit. Since the variables are many and interrelated as well, the situation seems hopelessly complicated. Nevertheless there will always be some combination of the variables which will give us the kind of deposit we want and, what is more important, ways and means exist for maintaining the selected set of conditions against the forces that act to change them. Our problem is to apply known facts and physical principles to the attainment of this end. This knowledge has already been applied to obtain control of chemical processes. It remains for us to do likewise with our electrochemical processes. With this in mind let us have a look at the five variables, one by one.

Temperature and Its Control

Temperature is an important variable in electroplating because it effects cathode polarization and cathode and anode efficiency. In the early days of plating, a gas flame was usually lit under the tank and that was it. The flame was adjusted by eye and the temperature told by touching the solution gingerly with a finger if a thermometer was not available (or the operator too lazy to use it). Today, in many plants control is not much better than this. However, we now have available several excellent automatically controlled systems for holding any desired temperature in a plating bath to within a half a degree or better and more and more of these systems are being installed as time goes on. Since a given temperature that has been selected as best for the purpose can be closely held at all times by this means, we can obviously forget about temperature as a variable in our dream plating bath.

Agitation and Its Control

Agitation of the plating bath is important because it thins the cathode film, promotes uniform conditions throughout the plating bath and speeds the transport of fresh material to the cathode. In the early days of plating, agitation was mostly by hand and it was a variable to which much artistry was attached, as for example, in gold plating. By varying the speed of "tapping" several different color shades could be obtained. We then graduated to reciprocating mechanisms, air or gas agitation, propellers and pumping methods for special cases, and have now reached the use of vibrations in the sonic, and ultrasonic ranges and higher.

Most of these methods for producing turbulence in the plating solution are amenable to automatic control. For example, if we use air agitation we can, by controlling the pressure of the air, control the amount of turbulence produced in the solution. If we want to increase the turbulence we can increase the pressure; if we want to diminish it we can lower the pressure. This can be done for us automatically in several ways. We might have as a case in point, a "sensing cell" exposed in the plating bath, which registers polarization effects. Since the polarization in this cell will be a function of the agitation in the bath, we can, through an electronic circuit, control the opening and closing of the air valve automatically. If we want to split hairs finer, we can even determine by a method such as this, the proper air pressure to use to obtain the correct average rate of agitation for a given type of work! In any event we can hold and control solution agitation at any desired level. This means that, essentially, we can put agitation as a plating variable, under complete control.

Time and Its Control

Time is usually considered as an independent variable in plating and of importance in the plating bath only in the sense that it controls the thickness of the deposit. Actually it is not a completely independent variable and it controls far more than the thickness of the deposit.

When we speak of time, we usually refer to chronological time as measured by a clock. When we speak in the plating bath we must speak in terms of *electrochemical* time which is not measured by a clock but by an ampere-hour meter. Many platers fail to realize this.

Suppose, for example, we made up a simple acid copper solution using copper sulfate and sulfuric acid, put it into a tank and never used it for a year. At the end of the year that solution would chronologically speaking be a year old, but electrochemically speaking, it would not yet have been born! Why? Because no

changes have taken place in the solution. It is exactly the same as it was on the day was made it up, according to the first time measure. However, the moment the bath is put into use and a current is passed through it, the bath begins to age. Decomposition and recomposition takes place, reactions occur which cause an actual change in the bath, the change depending on the current and the time the current was passed. This combination is the unit of electrochemical time, the coulomb, and we measure it with an ampere-hour meter.

It is very much analogous to the situation found with automobiles. You measure the true age of a car by its speedometer reading (provided it hasn't been tampered with!) and not by the calendar.

One wouldn't think of driving a car without a speedometer which will record the true age of the car and the rate at which the car is being aged, yet most platers operate their plating baths without an ampere-hour meter. It is a case of neglect that is hard to understand because many valuable control functions can be performed by an ampere-hour meter. For example, it can tell you how much metal has been plated out of the bath, it can help govern the addition of brighteners and replenishing chemicals, it can tell you when to purify the plating bath. It can help you obtain much smoother trouble free operation, just as, in the same sense, you look at your speedometer totalizer and say, "It's time for a lube job" or "I'll have to have my 10,000 mile checkup."

Now it is true of course that certain ingredients in the more complex types of plating baths age primarily with chronological time, but even this can be tied in with electrochemical time because of the simple relationship between the two systems, namely

$$\text{Chronological time} = \frac{\text{Electrochemical time}}{\text{amperes flowing}}$$

so that the ampere hour meter can and should play an extremely important part in the operation of a plating bath. It is incomprehensible why this control instrument has been so long overlooked by the plater. With it we have an excellent means for controlling electrochemical time. All we have to do is use it!

Electrical Energy and Its Control

Electrical energy plays an extremely important role in electroplating, both from the standpoint of current flow and potential. Of primary interest, however, is the current density or amperes flowing per unit area of the work surface or cathode. This determines, to a large extent, the type of deposit we will obtain and, in conjunction with chronological time, the thickness of the deposit.

Years ago, the source of the electrical energy used in plating was a crude battery of wet cells and little use was made of either voltmeters or ammeters. We then moved on to generators and rectifiers but the problem of controlling current density is still with us.

To put this problem in simple, ideal terms, suppose we have a piece of work that has an area of one sq. ft. We put it into the tank and then adjust the voltage so that a certain current will flow, say twenty amperes, which provides the correct current density for this piece. We now hang another similar piece of work in and must then readjust the voltage at the tank in order to obtain forty amperes, so that each piece will receive its required twenty amperes, and so on. This of course assumes that each piece will receive its fair share of the total amperage. In general, this assumption holds quite well where the pieces are similar, though we do know of course that edge pieces, top, bottom or side, will usually receive a little bit more than their fair share of the current.

If we use a constant tank potential rectifier (quite a few are already in use in the plating field) which puts a constant voltage across the tank regardless of the load in it, this is a first approximation to constant current density control because then the current to each piece put into the tank will very roughly vary with the area of the piece. But this is not sufficient for close control of current density because, if the work varies considerably in size (we are still talking in terms of flat pieces), the approximation becomes too approximate. What is meant is that, if a workpiece with one square foot of area is put in the tank and draws 20 amperes, a single piece of the same shape but four times the area will not necessarily draw 80 amperes. The amount it draws may be closer to 60. Likewise four one-foot-square pieces will draw more current when placed in the tank than a single piece with the same total area. However, if the pieces are similar in size and shape or do not differ in area by more than fifty percent or so, fairly close current density control can be achieved by this method of applying a constant potential to the plating tank. Indeed, for automatic plating tanks where the loads are similar, this method for controlling the current density can be quite satisfactory.

It is obvious that we cannot hope to work out a system for maintaining a true constant current density if we are going to plate a variety of differently shaped and sized pieces at the same time. Fortunately, in automatic plating and in, many cases in job plating, the tank is usually loaded with similar type pieces at one time. If this is the case, we can approach constant current density control and uniform current distribution among the pieces as close as we care to.

For example, a first step in this direction is the use of a constant tank potential arrangement. An improvement on this is to use a system which increases the potential at the plating tank according to a certain pattern (see Fig. 3), to make up for internal voltage drop. Another improvement, electrically speaking, to

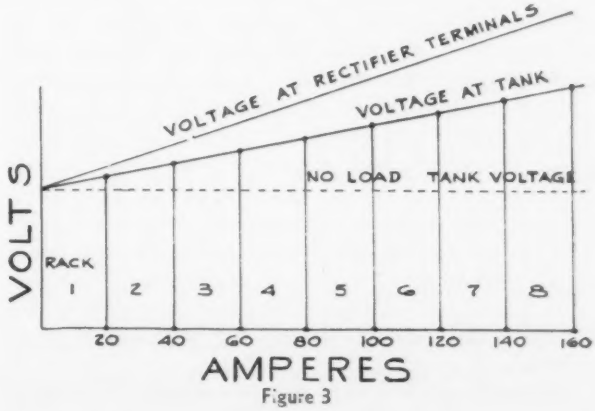


Figure 3

aid in achieving uniform current distribution on similar type pieces, is to have external resistances in series with each item to be plated. This can be accomplished by using small coated resistors in series with each rack hook. This is an excellent method for getting good distribution of the deposit among similar pieces on a rack where uniform distribution is important. The only drawback is that a higher potential than the usual 6 volts must be applied in order to get the correct drop across the tank. We can also make use of auxiliary anodes, bipolarity, current thieves and shields, and, finally, we can attempt to improve the characteristics of the plating solution itself so as to get better current distribution on the work. In any event, while we cannot achieve perfection in this particular control department, we can get close enough to it for all practical purposes to say that, for a given class of work, we have current density control.

Composition and Its Control

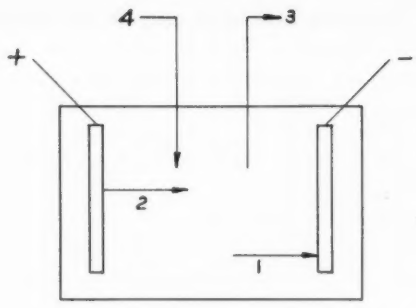
The basic variable of all plating baths is composition. What is the plating bath made up of and how much is there of each ingredient? To make things easy let us consider a very simple plating bath — an acid copper solution consisting of two ingredients, copper sulfate and sulfuric acid. Let us say we have found a concentration range of these two components which will give us a deposit with the properties we want, all other things being equal. How do we go about maintaining this composition indefinitely?

By studying Fig. 4, it can be seen that, when the bath is put into use, (1) copper metal leaves the solution in the form of a deposit, (2) copper metal enters the solution from the soluble anodes and (3) a little copper sulfate and sulfuric acid leave the solution in the form of dragout. These are the forces acting to disturb the conditions we are trying to maintain. In addition, there is the little considered effect of contamination brought in on the work and from outside sources, which also acts to change the composition of the bath. The answer to all this is chemical analysis or control.

In the old days the plater knew little about analysis. All he had available for controlling composition was a hydrometer and a sense of taste — and he accomplished a great deal with them!

From this crude beginning we have gone on to gravimetric and volumetric analysis, colorimetric, conductometric, potentiometric, amperometric, chromatographic, spectrographic, polarographic, complexometric analysis and a dozen other methods for determining composition. But — with all these wonderful methods of analysis we are still controlling the basic variable of the plating process with a hand valve? Certainly there is more finesse in these newer methods of analysis, but it still is a hand valve method of control because we have to add in and take out from the bath according to our analytical findings. No matter how much we refine the analysis method, there is still a lag between the finding and the correcting which depends on the human being operating the process. If we can draw on our steam engine analogy, plating-wise, we are still back in the days before the governor was invented!

The next step forward must be *automatic control* of



1- COPPER LEAVES SOLUTION AS DEPOSIT.
2- COPPER ENTERS SOLUTION FROM SOLUBLE ANODES.
3- COPPER SULFATE H_2SO_4 LEAVE BY DRAGOUT.
4- CONTAMINANTS ENTER SOLUTION.

Figure 4

composition, which will bring the plater a step closer to the perfect plating solution. How can such a thing be accomplished? There are several ways. Still thinking in terms of our simple copper solution, consider the schematic diagram in Fig. 5. Copper sulfate has a color which varies in intensity with concentration. The electrical resistance of the solution is a function of the acid content. Accordingly, the plating solution is pumped through a sensing cell where its resistance is measured and a beam of light passes through the solution to a photocell. If copper content is low and acidity high, more auxiliary copper anodes are thrown into the circuit. On the other hand if copper content is high and acidity is low, insoluble lead anodes are thrown into the circuit and copper anodes are taken out. This can be done in a crude way right in the plating tank itself or, with considerably more finesse and smoothness, in a secondary controller bank which supplies the main tank. This gives us an automatically controlled system in which we would *never* have to analyze the plating solution except to make an occasional check on the automatic controller!

Now we can take on a more complex situation. Suppose we are asked to turn out a bright copper — what then? We can adjust our basic composition controller to automatically hold the composition found best for production of a smooth deposit, but now we will have to add a new ingredient to the solution — a brightener. Usually these brighteners are organic in nature, difficult to analyze by ordinary methods. How will we control this new factor of composition? Again, there are many ways.

Suppose, for example, that we have a moving endless strip of metal, as shown in Fig. 6, which dips continually into the bath and receives a deposit of copper metal at the standardized current density. This deposit is then stripped off in a miniature stripping tank, the metal belt is rinsed and returned for a deposit. As the strip comes out of the bath with the plate on it, it passes through a photocell arrangement which measures the brightness of the deposit. If the brightness goes off a set value more brightener is added, or removed through an adsorption unit, as the case may require. In other words, we are controlling the inflow of the ingredient by the immediate effect of that ingredient, which is as close to the basic governor principle as we can hope to get.

Now we've gone this far we might as well get in a little deeper. What about contaminants? These effect composition and they cannot be avoided. For example, brighteners may decompose with a harmful effect on the deposit, or the work may drag in a harmful ion. How can we handle them?

Again, this is not too difficult a problem. Contaminants, that effect the bath adversely, usually reveal themselves by their marked effect on cathode polarization (or anode polarization if the deposit itself is not harmed). As shown in Fig. 6, a polarization sensing unit could at once feel out the presence of harmful impurities which, as they approached a certain level, would throw a bath filtration and purification unit into operation in which there would be adsorption, dummying, and ion exchange purification taking place. Should the impurity be suddenly added in such great amount that the purifying unit could not cope with it in time enough to remove it without harm to the work, an alarm signal could be set off so that no more work would be added to the tank until the impurity level was lowered to a safe value. In this way there would be no rejects due to the presence of contaminants in the plating tank.

If the question of pH comes up, since it likewise is a function of composition, it can be dismissed at once as a problem already licked because there are on the market today several automatic pH controllers (and there are a number in use, in plating plants!) which will automatically keep the pH of a given plating solution at a set value, where fixed pH is critical in the operation of the bath.

There can be no doubt that, based on methods such as have been outlined for the simple copper solution, automatic composition control could be worked out for any type of plating solution. Then what is holding this development back? Nothing outside of the well known inertia of our industry. Cost cannot be argued as the drawback because, while full automatic composition control, which would certainly be costly at the outset, would not be warranted for a small job shop operation,

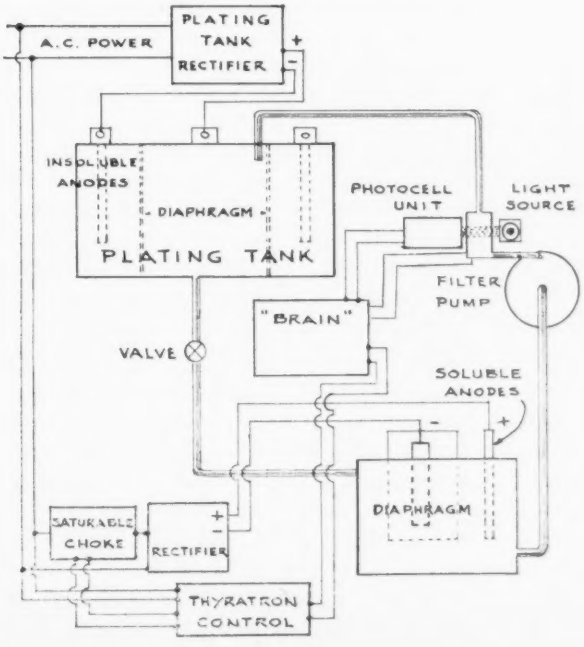


Figure 5

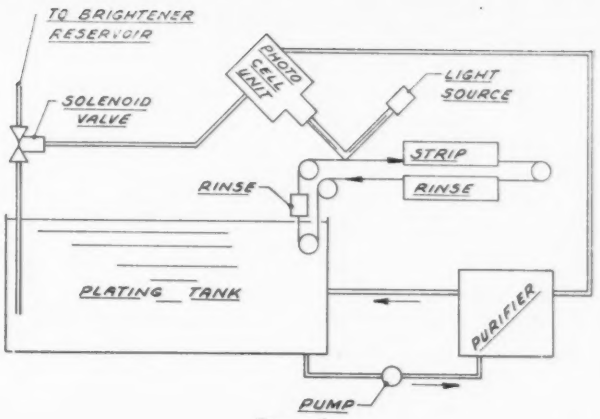


Figure 6

it most certainly would be warranted for large automatic plating tanks where an investment of a few thousand dollars in automatic control is a drop in the bucket compared to the cost of the plating installation, and the many savings made possible by it.

Finally, by combining the elements of temperature, agitation, time, current, and composition control into one unit, we would have, in effect, what amounts to an electronic "plating brain" which would keep a plating bath running at its peak indefinitely, and we will have arrived at the plating millenium described in an article written in 1949 [J. B. Kushner, Metal Finishing, **47**, 48 (Sept. 1949)] from which we would like to quote:

"Picture to yourself a modern plating plant in which a plater has little else to do but load and unload the work. He does not have to adjust the current every time he hangs a rack on the cathode bar, nor does he have to adjust the current every time he removes a rack from the tank. The current density on the work regardless of how full or empty the tank is, is always kept constant at the optimum value; the metal content of the bath is always the same so little or no analysis is required; the pH is automatically controlled; brightening and addition agents are automatically fed to the solution and constantly maintained at the correct concentration; the solution is filtered automatically without any attention on the part of the plater; bath temperature is always uniform and constant and water evaporation losses are continually replenished; impurities of a harmful type which work themselves into the solution are continuously purged from the solution so that the concentration of impurities is always below the danger point. Uneventful, uniform operation, with aspirin tablets back on the druggist's counter where they belong!"

Six years ago this may have sounded like a wild dream to some but, in the light of what has already been accomplished in electronics and automatic control, the dream is about to become a reality. In fact, the only thing wrong with the whole prediction can be found in the first sentence, "in which a plater has little else to do but load and unload the work," because automatic controls will even take away from the plater the job of loading and unloading the tanks! We will have made our dream come true, but in the process we may have dreamed ourselves out of our jobs. But don't let's worry about this phase of it too prematurely. It's still a long way off and in the meantime let us do the best we can with the control methods we have.

Electropolishing "Nimonic 80"

By K. F. Lorking, *Aeronautical Research Labs., Victoria, Australia*

Summary

CONDITIONS of optimum electrolyte composition, current density, cell voltage and temperature have been established for the electropolishing of "Nimonic 80." An explanation is offered for the influence of chromium in the alloy on its electropolishing characteristics.

Introduction

Specimens having a surface finish which was reproducible and free from irregularities, were required for high temperature experiments. It was decided that these requirements were best met by electropolishing. Nimonic, which is a nickel alloy containing 18% chromium and small percentages of other elements, has been electropolished in an aqueous phosphoric-sulphuric acid solution,[1] also in glacial acetic and perchloric acid.[2] It was decided to experiment with the former bath as it is less unpleasant to use than the latter.

Experimental Procedure and Results

The composition of a bath for the electropolishing of Nimonic was first determined. The correct current density, and temperature for optimum bath operation were then found.

BATH COMPOSITION:

Use was made of the "Hull" cell[3] which enables one to investigate, in a single test, the electropolishing characteristics of a given solution over a wide range of current densities. Specimens for this phase of the work were in the form of plates, 3⅞ in. by 3 in. on which a test finish had been prepared by abrading with coarse emery paper.

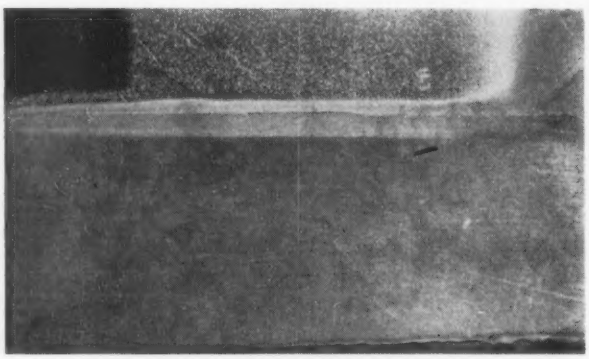


Figure 1. "Nimonic" plate, after "Hull" cell test using sulphuric acid - phosphoric acid solution. Polishing has occurred at the high current density end of the specimen. Magnification x1.5.

Attempts were first made to electropolish the alloy in aqueous sulphuric acid solutions, and in aqueous phosphoric acid solutions. Although polishing sometimes occurred, no consistently satisfactory finish could be obtained. Both the acid concentration and current density were varied over wide limits. Tests in sulphuric acid - phosphoric acid solutions were more promising. The bath initially used contained, by weight, 15% sulphuric acid, 60% phosphoric acid and the balance water, the tests being carried out at 37°C. It was found that, when a current of at least 4 amps. was passed through the cell, polishing occurred at the high current density end of the specimen (Fig. 1). Variations were made in the relative concentrations of sulphuric and phosphoric acids, but satisfactorily polishing could only be obtained within narrow composition limits. The best results were obtained in a bath consisting of 15% sulphuric acid, 64% phosphoric acid and the balance water.

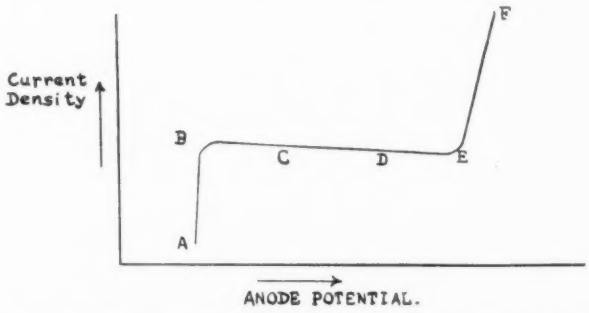


Figure 2. Classical current density — anode potential relationship for aqueous electropolishing baths. Cation formation occurs in region AB, partial passivation of the surface takes place in region BE, and oxygen evolution commences at E. Electropolishing is normally confined to region BE.

During the experiments it was observed that polishing occurred to a limited extent in both pure phosphoric and pure sulphuric acid solutions, and several interesting features were noted during the polishing processes in these electrolytes. Polishing in sulphuric acid solutions occurred at high anode potentials where oxygen evolution was rapid and there was no static anode layer (i.e. in the region corresponding to E. F. in Fig. 2). On the other hand, polishing was observed in phosphoric acid solutions at both high and low anode potentials — (i.e. regions corresponding to B.C. and D.E. of Fig. 2. Also, in phosphoric acid solutions, the appearance of the anode layer changed from a viscous yellow layer formed in sulphuric acid — phosphoric acid mixtures to a spongy black layer; this indicated the formation of a nickel oxide.

Certain organic addition agents such as glycerol and surface active agents have been shown[3] to improve anodic finishes on copper in phosphoric acid solutions. However, the addition of such agents to the phosphoric - sulphuric acid mixture caused a deterioration in the quality of the surface finish obtained on Nimonic. The presence of these addition agents was also observed to change the color of the anode layer liquid from yellow to green, presumably due to the addition agent acting as a reducing agent in the presence of chromate ions.

Determination of Optimum Electropolishing Conditions:

Optimum electropolishing conditions in 15% sulphuric acid — 64% phosphoric acid were then determined. The test specimens were Nimonic discs, 1" in diameter. One face of the discs was abraded with emery paper to provide a test finish; the other side was covered with a lacquer, to confine electrolytic action to the test surface.

(a) Current Density:

It was found that the best current density for polishing Nimonic corresponded to an applied voltage immediately below that at which oxygen evolution commenced. However, some difficulty was experienced in stabilizing this condition. The anodic current density was found to decrease when products of anodic dissolution built up at the anode; simultaneously the anode potential rose to such a value that local oxygen evolution commenced, the anode layer was lifted, and the surface finish deteriorated. These results indicated that improved polishing might be obtained either by raising the bath temperature or by stirring the solution in order to stabilize the anode layer thickness, and give a steady current density. The following experiments were made to test these points.

(b) Temperature:

The effect of altering the bath temperature was investivated over the range from 20 to 80°C. Raising the bath temperature produced some improvement in the stability of bath conditions and the rate of polishing was considerably increased. This resulted in a progressive improvement in the surface finish as the temperature was increased to 70°C.; at higher temperatures the surface finish deteriorated due to removal of too much of the anode layer. The influence of temperature on the maximum current density at which polishing occurred is shown in Table I and Fig. 3.

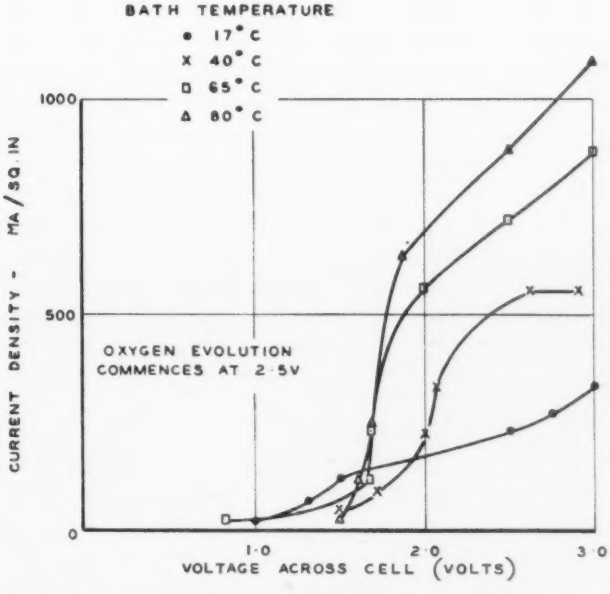


Figure 3. Influence of bath temperature on the current density across Nimonic anodes in the sulphuric acid - phosphoric acid electropolishing bath.

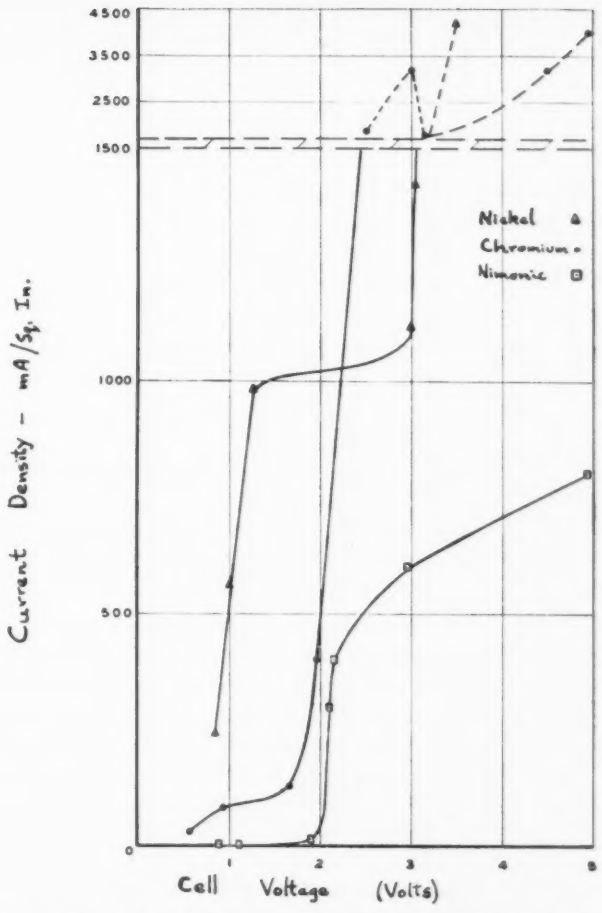


Figure 4. Anode potential - current density relationships for chromium, nickel and Nimonic 80, in a bath containing 66% HNO_3-34% alcohol, at room temperature.

TABLE I

Temperature (°C.)	*Current Density (Amp./sq. in.)*	*Applied Potential (Volts)*
17°	0.27	2.75
40°	0.55	2.75
80°	1.00	2.75

(c) Agitation:

No method of bath agitation was found which was effective in improving the surface finish obtained on the electropolished specimen.

Discussion

It has been shown that bath composition and current density must be controlled within narrow limits for the successful electropolishing of Nimonic. This control is stricter than is necessary when electropolishing pure nickel or chromium[4] in baths of similar composition, e.f. Hothersall and Hammond[5] have shown that nickel can be satisfactorily polished in a 73% sulphuric acid solution at current densities varying from 0.14 to 2.8 amp./sq. in.

In addition, it is considered that differences in both the anodic current density across nickel, chromium and Nimonic in the same solutions, in the same voltage range and at the same temperature (Figs. 4, 5) and the ranges of current density over which these metals may be polished in identical baths, are too great to be

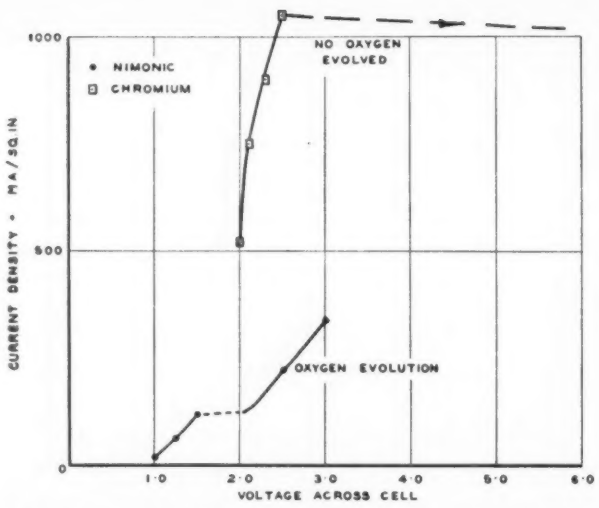


Figure 5. Anode potential - current density relationships for chromium and Nimonic 80 in the sulphuric acid - phosphoric acid polishing bath.

explained in terms of variations of anode layer viscosity, and effective cationic radius, hence cation diffusion coefficient,[6] alone. It is thought that differences in the passivating power and stability of the anode films formed on the various anode surfaces may be partly responsible for the differences in the ranges of current density over which polishing may be obtained. It is probable that an oxide film is partly responsible for the partial passivity of the anode, and possible that the stability and passivating power of an anodically formed nickel-chromium oxide film is greater than that formed by pure nickel or chromium.

The stricter control necessary for electropolishing Nimonic probably arises from the presence of chromium in the alloy, since the chromium appears to increase the range of stability and passivating power of the film formed on the anodic metal surface.

Conclusion

It has been shown that Nimonic can be successfully electropolished in a sulphuric acid - phosphoric acid bath provided that both the current density and bath temperature are carefully controlled.

The best electropolishing results were obtained in an electrolyte containing 15% sulphuric acid, 64% phosphoric acid, with the balance water, operated at a temperature of approximately 70°C. with a cell voltage of 2.5-2.8 volts.

Acknowledgement

The author is indebted to the Chief Scientist, Department of Supply, Australia, for permission to publish this work.

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4. K. F. Lorking. Unpublished work on the electropolishing of chromium.
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Finishing Pointers

Determination of Oil In a Vapor Degreaser

By J. B. Mohler

Consultant, New Castle, Pa.

A VAPOR degreaser is a very useful and much used piece of equipment for removal of oil from metal surfaces. Cleaning is complete by virtue of the fact that perfectly clean solvent flows over the surface of the piece exposed to the vapors. In any other cleaning process the cleaning medium contains the materials removed from the surface. The vapor degreasing process is simple and it is a one step process.

Like any other process, this one must be maintained. The equipment must be cared for and the solvent must be controlled. By such care and control long life and economical operation can be obtained. Instructions are supplied by the manufacturer on how to care for the equipment and, if these are followed, good results will be obtained. These instructions usually contain a table giving the increase in boiling point with increase in oil content of the solvent. By the use of a thermometer to measure the temperature of the boiling solvent, the oil content at any time can be readily determined.

It is very important to determine the oil content. If the oil content is low, there are still hours of operation left before replacement or distillation of the solvent will be necessary. If the oil content is high, trouble may be expected. If it is sufficiently high, oil will be vaporized at the high boiling point and work will be coated with oil rather than cleaned of oil. Also, when the oil content is high the oil will form a hard cake on the heating surfaces. This will result in loss of heat transfer and loss in efficiency. If electric heaters are used the loss of heat dissipation will result in overheating of the electric elements and eventual failure.

A means for measuring the oil content of the solvent also provides the control measurement necessary for recovery of solvent by distillation.

For small scale operation of electrically heated degreasers the following practice has been applied. The degreaser was used until the oil content reached 20%. The solvent was then boiled off by use of the degreaser as a still until the oil content reached 50%. This was discarded and fresh solvent was added to resume operation with a clean degreaser.

For larger scale operation it may be desirable to distill off essentially all of the solvent or at least distill to 90% oil. This would probably be done in a separate still.

Regardless of the size of the operation a measurement of the oil content of the solvent is required. A convenient way to do this is by gravity. The measure-

(*Concluded on page 79*)

Science for Electroplaters

3. Within the Atom

By L. Serota

ALTHOUGH the atomic theory proposed by Dalton was recognized as one of fundamental importance, subsequent developments indicated that the atom was not an indivisible particle. Evidence favored the view that it was a complex structure. Although this introduced some changes in the original assumptions, it did not disprove Dalton's theory. These changes, instead, amounted to an expansion of the atomic theory, and provided a more thorough explanation of the basic principles. As early as 1816 Prout advanced the idea that the weights of all atoms were whole numbers, not fractions, and might thus be multiples of the hydrogen atom. This plan, however, fell into disfavor when the values for fractional atomic weights were shown to be correct. Two such examples are chlorine (weight 35.46) and copper (weight 63.54). Later developments, such as proof of the existence of isotopes, showed that Prout's idea of whole-number weights, in a modified form, had some real significance. The fractional weights were shown to be due to mixtures of atoms of different weights (isotopes). The weight of 35.46 for chlorine is the result of a mixture of chlorine atoms with whole number weights of 35 and 37. The chemical properties of both these isotopes are identical.

Discoveries of the electron, proton and neutron, x-rays, radioactivity, and nuclear reactions, have gradually established the present view of atom structure. By this view a number of particles are considered essential to the structure of the atom. These fundamental particles of matter are the electron, proton and neutron.

The electron was the first of the sub-atomic particles to be discovered. The name was introduced by Stoney in 1874. The study of its characteristics was based upon the observations of

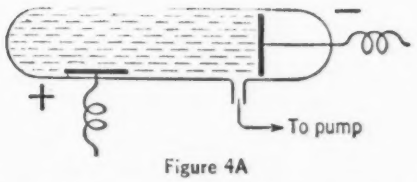

Figure 4A

cathode rays in a highly evacuated tube. Sir William Crookes in 1879 showed that these rays were emitted from the cathode in this tube when a high potential was applied.

The following characteristics were observed for these rays (Fig. 4a, 4b):

The rays are bent in an arc when a magnet is brought close to the tube.

They travel in a straight line from the negative pole (cathode).

They cast shadows of obstacles placed in a path between the cathode and the glass wall.

A pinwheel will turn if placed in the path of these rays.

If the rays are allowed to strike (impinge) against a thin metal foil, the foil becomes hot.

The glass wall of the tube will give off a greenish-yellow glow (fluorescence).

That these particles were negatively charged was demonstrated by J. J. Thomson in 1879. He showed that these rays were deflected (bent), towards a positively charged plate in an electromagnetic field. Further experimental results indicated that the mass of the electron is about 1/1838 that of the hydrogen atom.

An adaptation of this study to industry is the development of the electron-microscope. The structure of a nickel deposit was studied with this instrument by obtaining an electron-micrograph. This was part of Project 9 of the A.E.S. Research Program, "Physical Properties of Electrodeposited Metals." An R.C.A. type EMU 50 kv. electron microscope (Fig. 5) was used. A deposit one millionth of an inch thick was plated over a thin layer of copper. The copper was plated on a cathode of stainless steel. The nickel was coated with a plastic film acting as a protective layer. After the copper-nickel deposit was peeled from the stainless steel cathode, the copper was dissolved, using a mixture of chromic acid and sulfuric acid. The nickel deposit was not attacked. The plastic coating was removed from the nickel foil before the electron micrograph was made.

In 1879 W. C. Roentgen made an important discovery while studying the glow produced in the cathode ray tube. The tube was enclosed in black cardboard and kept in a dark room. Near this tube some paper coated with the compound barium platinocyanide happened to be placed. When the tube was operated, the paper exhibited a much brighter glow than the greenish-yellow glow which customarily appeared on the glass wall of the tube. These rays, which apparently penetrated the glass wall and the paper, he called "X-rays."

Further study showed that the power of these rays were sufficient to penetrate an opaque body such as the hand. By placing a photographic plate behind the hand, an X-ray photograph of the hand was obtained and the struc-

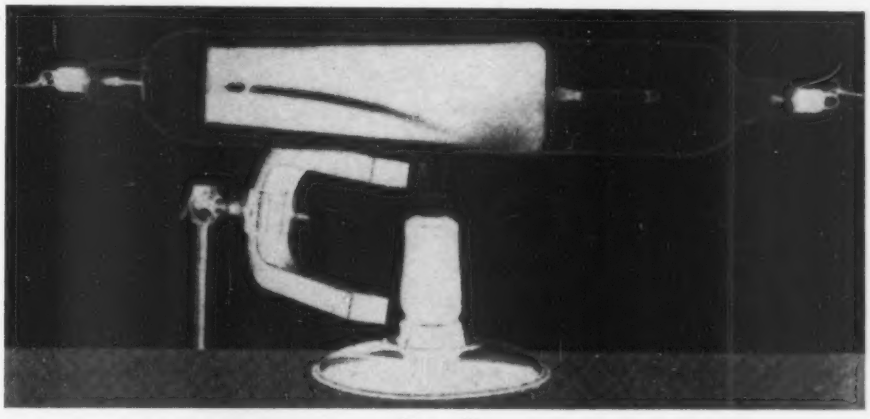

Figure 4B

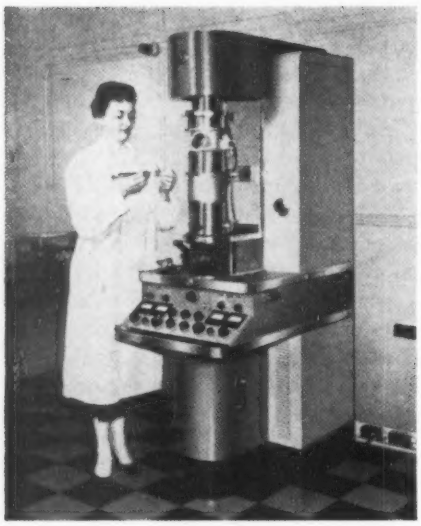

Figure 5

ture of the bones of the hand were thus revealed. These rays result from the bombardment of a target (called anti-cathode) placed in the path of the cathode rays (Fig. 6). The X-rays are given off by the anticathode. Better results are obtained when metals are used as the target.

Because of the penetrating power of the X-rays, it has become a valuable instrument in scientific studies. Its use in electroplating has been suggested for measuring the thickness of a plated coating. Another instance of its application in electroplating is the study of the structure of nickel electrodeposits as revealed by the X-ray diffraction patterns. The samples of electrodeposited nickel used were cut from electroformed sheets. X-ray studies also show that electrodeposited brass has the same structure as cast alloys with the same composition. X-ray studies indicated that the brightness of zinc and cadmium deposits increased with the orientation of the fine crystals.

Continued studies of cathode rays disclosed the presnce of positively charged rays or canal rays. The name was proposed by J. J. Thomson in 1907. Unlike the electrons, the charge and mass of these positive rays were not the same. The value varied with the gas introduced in the cathode ray tube. The simplest of these units was much heavier than the electron. Rutherford, in 1914, described the lightest possibly charged particle as possessing the same mass as the hydrogen atom. The name proton (from the Greek protos = first) was selected for this particle. The proton is 1838 times the weight of the electron and is an important unit in the structure of atoms.

Radioactivity

The discovery of X-rays by Roentgen led Henri Becquerel to seek some connection between the luminescence exhibited by a uranium salt and X-rays. He found in 1896 that photographic plates wrapped in black paper and placed beneath a crystal of the salt became dark. This seemed to indicate that the uranium salt had emitted rays. Another observation made was that the uranium mineral ionized the surrounding air. This was detected by means of a gold leaf electroscope (Fig. 7). The name radioactivity was given to this phenomenon in 1898 by Marie Curie. The discovery led to the detection of other radioactive elements. Foremost was that of radium, discovered in 1898 by Marie and Pierre Curie. The emitted rays from these radioactive elements consisted of alpha (α) rays, beta (β) rays, and gamma (∂) rays. The alpha ray is positively charged and its mass is the same as that of the helium atom; the beta ray is negatively charged and is identical with the electron; the gamma ray cannot be deflected by an electromagnetic field and resembles X-rays (Fig. 8).

The neutron was the last of the subatomic particles to be discovered. Its existence was first considered in 1920 by a number of investigators. The particle was believed to result from the neutralization of a proton by an electron, forming a neutral or uncharged particle. The mass was equal to that of the hydrogen atom. The name was introduced then by W. D. Harkins. Discovery of the neutron is attributed to James Chadwick who, in 1932, identified it as a result of bombarding the element beryllium with alpha rays emitted from the radioactive element polonium. Since the neutron is a neutral particle, it does not ionize the surrounding air or vapors. It does possess, by the same property, immense penetrating power and, for that reason, is an important unit in atomic fission. Some values for the particles described are listed in the table below.

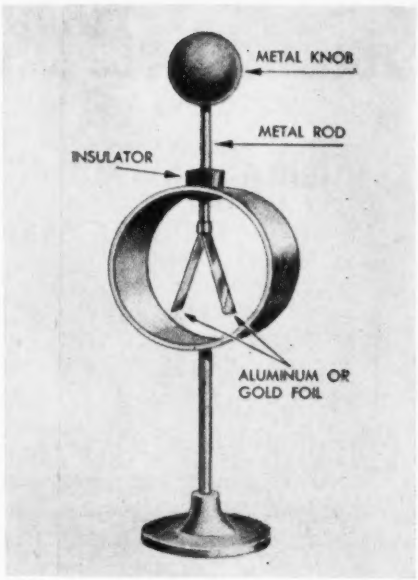

Figure 7

Fundamental Particles	*Symbol*	*Charge*	*Approx. Mass Atomic Weight*
Proton	p	+	1
Electron (beta particle)	e	—	0.0054
Neutron	n	0	1
Alpha Particle	α	+2	4

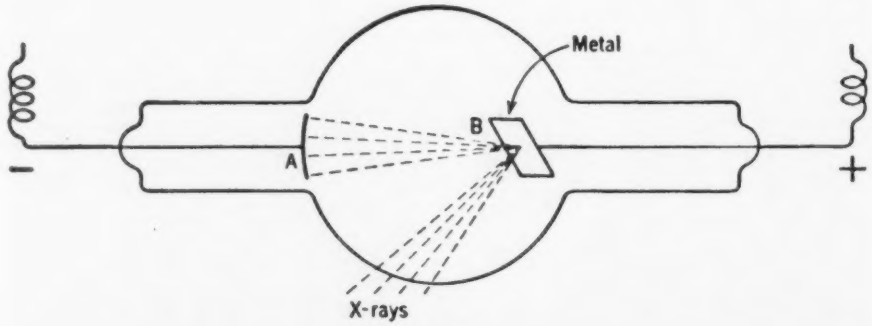

Figure 6

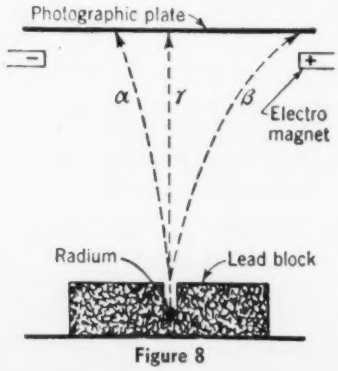

Figure 8

Structure Of The Atom

The accumulation of evidence supporting the existence of fundamental particles led to the development of the modern atomic theory. Although a number of explanations were advanced about 1895 concerning the arrangement of these particles in the atom, the foundation for the accepted theory is ascribed to the observations in 1906 of Earnest Rutherford and his coworkers, who conceived what is generally called the "Rutherford Model." When alpha rays, emitted from the radioactive surface, impinged upon a thin metal foil, most of the alpha rays penetrated the foil. An occasional alpha particle was deflected or scattered. The wide angle of this deflection was attributed to the repulsion of the positively charged alpha particle by the positive charge of the metal. This charge, they believed, was concentrated in a very small area of the atom. Rutherford later (1912) called this the "nucleus." The fact that most of the alpha particles were not scattered implied that the greater part of the atom must be an "empty" structure. Since the atom is neutral, the positive charge of the nucleus must be balanced or neutralized by an equal charge of the electrons surrounding the nucleus.

The value of the charge on the nucleus was determined by Mosely in 1913. The method he used was to photograph the X-ray spectra (Fig. 9a, 9b) of a series of elements in the order of their position in the periodic table. For this purpose he used the elements calcium to zinc. The mathematical data derived from these photographs led him to conclude: "We have here a proof that there is in the atom a fundamental quantity which increases by regular steps as we pass from one element to the next, using the chemical order of the elements in the periodic system. This quantity can only be the charge on the atomic nucleus." This is called the atomic number of the element. This number of unit charge on the nucleus is approximately half the atomic weight of the element and corresponds to the number of the place occupied by the element in the periodic table. The arrangement of the elements in the first two rows of the periodic table will show this: (Table 1)

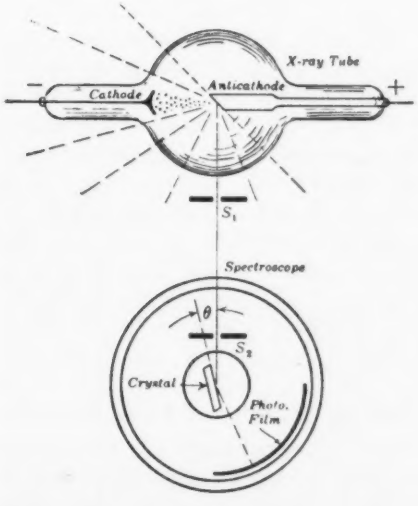

Figure 9A

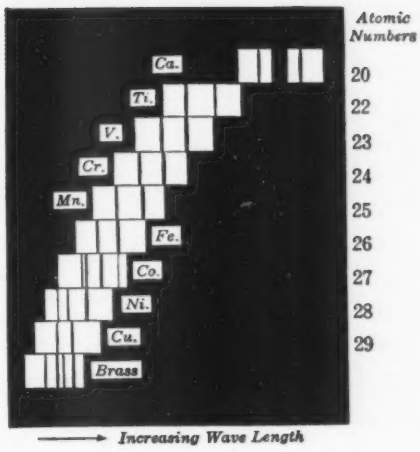

Figure 9B

Unlike the periodic law involving atomic weights introduced by Mendelejev, this law is exact. An element is now defined as a "substance composed entirely of atoms of the same atomic number." The method of X-ray spectrographs used by Mosely in this investigation has been of immense value in discovering new elements.

The number of electrons surrounding the nucleus must be equal in number to the positive charge (atomic number) of the nucleus to maintain a balanced or neutral atom status. These are commonly referred to as orbital electrons or extranuclear electrons. The atomic number of an element will, therefore, represent the nuclear charge of the element as well as the number of electrons (orbital) surroundings it. The atom is thus divided into two parts; a very small nucleus carrying a positive charge and virtually the entire mass; and the orbital electrons (negatively charged) in a very large space. A building up arrangement of the elements thus becomes possible on the basis of the information available. The hydrogen atom with but a single positive nuclear charge (atomic number 1) will carry one extranuclear electron to establish a neutral condition. Since the mass of the hydrogen atom is close to one, the mass of a proton is the same as that of hydrogen. Following this scheme, the arrangement for the nuclear charge and the orbital electrons for the elements of the first two rows becomes: (Table 2)

Since the atomic number or nuclear charge of an atom is approximately half its atomic weight, the remaining weight in the nucleus must consist of positive charges. It was believed that

(*Continued on page* 75)

TABLE 1

	Element	*H*							*He*
I	Atomic No.	1							2
	Atomic Wt.	1.08							4.003
	Element	*Li*	*Be*	*B*	*C*	*N*	*O*	*F*	*Ne*
II	Atomic No.	3	4	5	6	7	8	9	10
	Atomic Wt.	6.94	9.02	10.82	12.01	14.008	16.000	19.00	20.183

TABLE 2

	Element	*H*							*He*
1	Nuclear charge (positive)	1							2
	Number of orbital electrons (negative)	1							2
	Element	*Li*	*Be*	*B*	*C*	*N*	*O*	*F*	*Ne*
II	Nuclear charge (positive)	3	4	5	6	7	8	9	10
	Number of orbital electrons (negative)	3	4	5	6	7	8	9	10

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Bright Dip for Steel

Question: We would appreciate any information you can furnish us with for a method to bright dip cold rolled steel tubing. Our problem is to get a bright finish wihout resorting to polishing the material to get the lustre.

M. W.

Answer: A very satisfactory bright dip was developed by Marshall and described in the November and December 1952 issues of Metal Finishing. The solution contains 25 g./L. oxalic acid, 13.0 g./L. hydrogen peroxide and 0.1 g./L. sulfuric acid. Operation is at room temperature.

However, we do not know whether dipping in this solution will serve to eliminate polishing of the steel tubing.

White Chromium Deposits

Question: About ten years ago I remember reading about a chromium plating solution called Triskalite, I believe, which was claimed to produce a deposit with a platinum-white color instead of the blue tone associated with regular chromium plate. I have been unable to obtain any further information on this process and would appreciate any assistance you could offer in this connection.

R. M.

Answer: This process was the subject of a patent to J. J. Triska in 1943. The patent claims the addition of a cadmium salt to the standard sulfate bath. An example of the solution is as follows:

Chromic acid	300 g./L.
Sulfuric acid	3 "
Cadmium oxide	20-45 "

The solution is dummied at 80-110 deg. F. and 5 volts until a test plate shows a platinum-like color, after which it is operated at 40-110 amp./sq. ft., 4-6 volts and 80-110 deg. F.

Pitted Copper Plate

Question: At regular intervals we have been troubled with a condition in our rochelle copper plating solution which has baffled us. As a result of your experience, we wonder whether you can suggest a possible cause. After plating for a few days on our tubular steel parts, pitting becomes evident and gets progressively worse. At the same time, the copper anodes turn a scummy greenish color. We then carbon treat the solution and the condition disappears for a short time. Our cycle is emulsion clean, cold rinse, reverse current alkali, cold rinse, acid dip, cold rinse, copper plate at 130 deg. F., 15 amp/sq. ft. for 20 minutes. We have noticed an oily film on the rinse tanks and acid dip, which we skim off every few hours, and which makes us suspect contamination from the insides of the tubes.

W. R.

Answer: The oily film on the surfaces of the acid dip and rinses, the pitted deposit and the green film on the anodes, together with the fact that carbon treatment eliminates the condition temporarily, all indicate that you are dragging oil-loaded emulsion cleaner over into the copper plating solution. A warm rinse should be used after emulsion cleaning and the parts allowed to drain completely before transferring to the electrolytic cleaner. Also, it would be advisable to dump the electrolytic cleaner more often to avoid build-up.

Bright Brass Finish

Question: Along with this letter I am sending you a sample. Will you please tell me how this plating can be done? Is it polished and then plated and lacquered, or is it some new method? What is the procedure?

T. N.

Answer: The sample forwarded was finished by polishing the diecasting, bright nickel plating for luster, followed by a flash brass plate and lacquer.

Matte Chromium Finish

Question: We are interested in the methods for obtaining a fine matte chrome plating on brass. This type of finish is common on cameras manufactured in Germany and in Japan.

L. B. J.

Answer: The fine matte finish on camera parts is produced by liquid abrasive blasting prior to electroplating. Details on the process will be found in the latest edition of the METAL FINISHING GUIDEBOOK under "Abrasive Blasting."

Silver Plating Specifications

Question: I am in possession of a set of silver plated flatware labelled "Ag/H/B", a marking which is completely unfamiliar to me. Is this a manufacturer's mark of some kind? The deposit appears to be quite heavy.

A. E.

Answer: The mark is a British designation of quality, known as the Epalex Standard. The designation Ag/H/B indicates that the flatware was plated for hotel use, with a thickness of silver of 0.001" or 16 dwt. per square foot of surface and should have a life expectancy of 10 years. Incidentally, this is not considered the highest quality for hotel use. Designation Ag/H/A1 calls for double this amount of silver with a life expectancy of 20 years.

Testing Porosity of Lead Deposits

Question: Can you give me a method suitable for determining the porosity of lead and lead alloy deposits? The deposits are applied to a copper base

metal by electroplating and also by hot dipping in molten solder formulations.

A. P.

Answer: A solution specified by the American Society for Testing Materials consists of 10 grams ammonium persulfate dissolved in 500 ml. water, to which is added 75 ml. ammonium hydroxide and sufficient water to make a total volume of one liter. Parts are immersed in this solution for 15 minutes at 83-87 deg. F. The intensity of the blue color is an indication of the porosity. A comparison standard can be prepared by dissolving a specified amount of copper sulfate in a solution of 75 ml. ammonium hydroxide per liter.

This solution is suitable for all deposits not attacked by ammoniacal persulfate, such as nickel, chromium, etc., but should be prepared fresh daily and kept at a temperature below about 100 deg. F.

Printed Circuits

Question: We are subscribers to METAL FINISHING and ORGANIC FINISHING and consult these magazines and your reference books frequently for information. We are at present desirous of obtaining information on printed circuits. If you should have any books on this subject or know where we can obtain this information we would appreciate hearing from you.

H. F.

Answer: Two publications are available on the subject. Circular 468 of the National Bureau of Standards, issued in 1947 and obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 25c per copy, describes printed circuit techniques.

Publication PB 111334, issued in 1953 and distributed by Business and Defense Services Administration, Office of Technical Services, Department of Commerce, Washington 25, D. C. at $1.00 per copy, describes metallic paints employed for this purpose.

Pitted Acid Copper Deposit

Question: We are forwarding two samples of acid copper plated leaves. You will note that, after filtering the solution, the copper plate is as badly pitted as before. We bought the filter because we thought dirt in the solution was the cause of the trouble. We were told to dummy the solution, but 48 hours showed no improvement. Your advice would be appreciated.

W. G. J.

Answer: The pitted appearance of the samples forwarded would indicate contamination with organic matter. It is suggested that the solution be treated with activated carbon in the amount of 5 lbs. per 100 gallons, then filtered after settling.

The activated carbon should not be added in the plating tank since it cannot be cleaned out completely and will result in rough work. If suitable rubber, plastic or lead lined storage tanks are not available, a polyethylene liner can be purchased for 55 gallon steel drums for only a few dollars.

Stripping Hard Chromium

Question: We are hard chrome plating cast iron plungers and molds, used in the glass industry. Our problem is how to strip the old chromium from a highly polished cast iron surface without etching the basis metal. We are currently using a strong steel electrocleaner 20 oz./gal. at 6 volts rev. current. Any suggestions you may have would be deeply appreciated.

J. E. B.

Answer: Your present method is as good as any for removing heavy chromium deposits from cast iron. If the cleaner is high in caustic, however, it should not be used for alloy steels. Stripping speed will be increased by heating the cleaner.

Other stripping methods for chromium will be found on pages 422-3 of the 1955 edition of the METAL FINISHING GUIDEBOOK.

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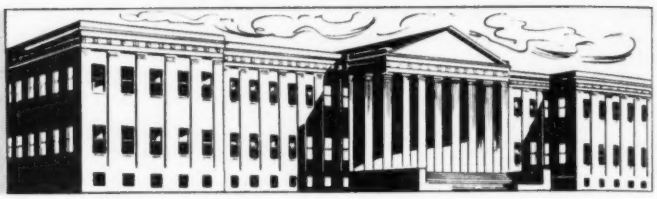
Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Formation of Reflecting Coatings

U. S. Patent 2,689,191. *Sept.* 14, 1954. *L. Pessel, assignor to Radio Corp. of America.*

A process of depositing a mirror-like coating on a surface of a solid object comprising applying to said surface a solution consisting essentially of a coating material selected from the group consisting of non-saponifiable hydrocarbon resins and chlorinated hydrocarbon waxes in a volatile organic solvent, permitting said solvent to evaporate thereby depositing on said surface a film consisting essentially of said coating material, and then applying a metallic film over said first-mentioned film by the process of chemical deposition comprising reducing a solution of a metal salt with a solution of a reducing agent.

Manufacture of Metal Articles by Electrodeposition

U. S. Patent 2,689,214. *Sept.* 14, 1954. *W. Soby, assignor to Electric & Musical Industries, Ltd.*

A method of manufacturing a metal article, said method including the steps of coating an electrode for a period of at least 5 seconds with an aqueous solution of albumen in proportions equivalent to at least 0.5 gramme per litre, said solution including, borax and an alkylated aromatic sulphonate, rinsing said electrode with water to remove said solution and to leave an adsorbed film of albumen on said electrode, electrodepositing metal through said film on to said electrode to form said article, and then separating said article from said electrode.

Gas Plating

U. S. Patent 2,689,807. *Sept.* 21, 1954. *R. A. Kempe and R. R. Ruppender, assignors to Thompson Products, Inc.*

In the method of coating a refractory metal article including the step of treating said article with a combined stream of hydrogen and a vaporized decomposable halide of the coating metal, the improvement which comprises surrounding the article to be coated with a closed continuous porous wall container of appreciable thickness having a uniform porosity of from 25% to 85% and being free from channels, embedding the article in said container in a porous ceramic packing, enveloping said continous wall container with a mixture of hydrogen and a vaporized decomposable halide of said coating metal, passing said mixture through said wall and packing to at least partially decompose said decomposable halide, and immediately thereafter depositing the liberated metal onto said article.

Metal Cleaning Pad

U. S. Patent 2,690,385. *Sept.* 28, 1954. *M. Richlin, assignor to Kimball Chemical Products Corp.*

A re-usable cloth for cleaning metals which is maintained moist by a humective material, said cloth being impregnated with a composition of matter having the following ingredients by weight: 15 to 35% of an acidic material having a pH below 4 in one per cent aqueous concentration, 15 to 35% of an abrasive material, 1 to 15% of a polyhydroxy alcohol and 33 to 67% of water.

Electroless Nickel

U. S. Patent 2,690,401. *Sept.* 28, 1954. *G. Gutzeit, W. J. Crehan and A. Kreig, assignors to General American Transportation Corp.*

The process of producing an intimately bonded and continuous layer of nickel upon the surface of a solid non-metallic body, which comprises exposing a fresh non-polarized surface of said body having incorporated therein and exposed thereon dispersed growth nuclei minute particles essentially comprising an element selected from the group consisting of iron, cobalt, nickel, aluminum, copper, silver, gold, palladium and platinum, and immersing said body in a bath consisting essentially of an aqueous solution of a nickel salt and a hypophosphite during a sufficient time interval to cause initial nickel plating upon said growth nuclei and subsequent growth of the nickel plating into a continuous nickel layer upon the fresh non-polarized surface of said body.

Electroless Nickel

U. S. Patent 2,690,402. *Sept.* 28, 1954. *W. J. Crehan, assignor to General American Transportation Corp.*

The process of producing an intimately bonded and continuous layer of nickel upon the surface of a solid non-metallic body, which comprises exposing a fresh non-polarized surface of said body, then contacting said body with a first aqueous solution of a palladium salt, then contacting said body with a second aqueous solution of a reducing agent in order to effect the chemical reduction of said palladium salt to metallic palladium so that dispersed minute metallic palladium particles are secured to the fresh non-polarized surface of said body, and then contacting said body with a bath consisting essentially of an aqueous solution of a nickel salt and a hypophosphite during a sufficient time interval to cause initial nickel plating upon said particles and subsequent growth of the nickel plating into a continuous nickel layer upon the fresh non-polarized surface of said body.

Electroless Nickel

U. S. Patent 2,690,403. *Sept.* 28, 1954. *G. Gutzeit, W. J. Crehan and A. Krieg, assignors to General American Transportation Corp.*

The process of producing an intimately bonded and continuous layer of nickel upon the surface of a solid non-metallic body, which comprises exposing a fresh non-polarized surface of said body having incorporated therein and exposed thereon dispersed growth nuclei minute carbon particles, and immersing said body in a bath consisting essentially of an aqueous solution of a nickel salt and a hypophosphite during a sufficient time interval to cause initial nickel plating upon said growth nuclei and subse-

quent growth of the nickel plating into a continuous nickel layer upon the fresh non-polarized surface of said body.

Electroplating of Germanium

U. S. Patent 2,690,422. *Sept.* 28, 1954. *G. Szekely, assignor to Sylvania Electric Products, Inc.*

A bath suitable for the electrodeposition of germanium at temperatures below 90°C. comprising a .5 to 10 volume per cent solution of germanium tetrachloride in an alkyl glycol whose hydroxyl groups are present in the 1, 2 position.

Strip Plating Apparatus

U. S. Patent 2,690,424. *Sept.* 28, 1954. *E. J. Hassell, assignor to National Steel Corp.*

In an apparatus for progressively electroplating a surface of an elongated metal strip, the combination comprising an electroplating cell including a tank adapted to contain a body of electroplating solution, roller means mounted at the ends of the tank for moving the strip progressively along a path across the tank from end to end with the surface of the strip in contact with the electroplating solution, an anode supporting means located in the tank below the path of the strip and presenting an inclined surface facing the path of the strip, the inclined surface extending transversely across the tank and across the path of the strip with the lower end of the inclined surface at one side of the path of the strip being farther away from the path of the strip than the upper end of the inclined surface at the opposite side of the path of the strip, an anode supported in the tank by the anode supporting means, the anode being below the path of the strip and spaced from the path of the strip, means for connecting the anode to a source of electroplating current, the anode including a plurality of elongated soluble anode elements movably mounted side by side on the inclined surface, each element being mounted on the inclined surface with its length dimension parallel to the path of the strip and being movable along the inclined surface laterally of the path of the strip in a direction toward the upper end of the inclined surface to compensate for erosion of the anode elements, one of the anode elements being adjacent the one side of the path of the strip and another anode element being adjacent the opposite side of the path of the strip, means for adjusting the lateral position of the one anode element on the one side of the path of the strip, a mask positioned at the upper end of the inclined surface adjacent the opposite side only of the path of the strip, the mask extending longitudinally of the path of the strip, and means for mounting the mask in spaced relation between the path of the strip and the other anode element, the last-named means including a mask supporting member mounted for movement along the inclined surface laterally of the path of the strip, and means for mounting the mask on the mask supporting member including means for vertically adjusting the mask supporting member including means for vertically adjusting the mask with respect to the mask supporting member.

Gas Plating

U. S. Patent 2,690,980. *Oct.* 5, 1954. *J. J. Lander, assignor to Bell Telephone Laboratories.*

The method of plating a surface which comprises maintaining the surface to be plated at a temperature of from 200°C. to 600°C., passing carbonyl vapor of a metal selected from the group consisting of tungsten, chromium and molybdenum together with carbon monoxide in addition to that produced by decomposition of carbonyl and up to 1,000 molecules of hydrogen per molecule of metallic carbonyl over the surface to be plated, and maintaining the pressure at from 0.001 to 12 millimeters of mercury at the surface.

Rust Removal

U. S. Patent 2,690,983. *Oct.* 5, 1954. *J. G. Meckler and Maurice C. Meckler, assignors to The Kromite Products Co.*

In a process of treating plated metal surfaces, eliminating rust from a chromium-plated surface on an iron base by applying moistening water and a small amount of polycalcium silicate and aluminate powder to a fabric, allowing action between the moistening water and powder for a few moments, then lightly rubbing such fabric on the rust-affected iron base chromium plated metal surface, and wiping dry.

Nickel Bath

U. S. Patent 2,690,996. *Oct.* 5, 1954. *H. Brown, assignor to The Udylite Corp.*

A method of electrodepositing nickel which comprises electrolyzing an aqueous acidic bath containing at least one nickel salt selected from the group consisting of nickel chloride, nickel sulfate, nickel fluoborate, nickel sulfamate and mixtures thereof, said bath also containing, in solution, not more than about .5% of at least one bath-soluble ester having the formula:

$$R-\overset{\overset{O}{\|}}{C}-OX$$

where

$$R-\overset{\overset{O}{\|}}{C}-$$

is the acyl radical of an unsaturated aliphatic monocarboxylic acid containing not more than 6 carbon atoms and the unsaturation of which is due solely to double bonds, and X is a member selected from the group consisting of methyl, ethyl, 2-methoxyethyl, 2-ethoxyethyl, 2-(β methoxyethoxy) ethyl, phenyl, and 2-phenoxyethyl.

Cyanide Copper Bath

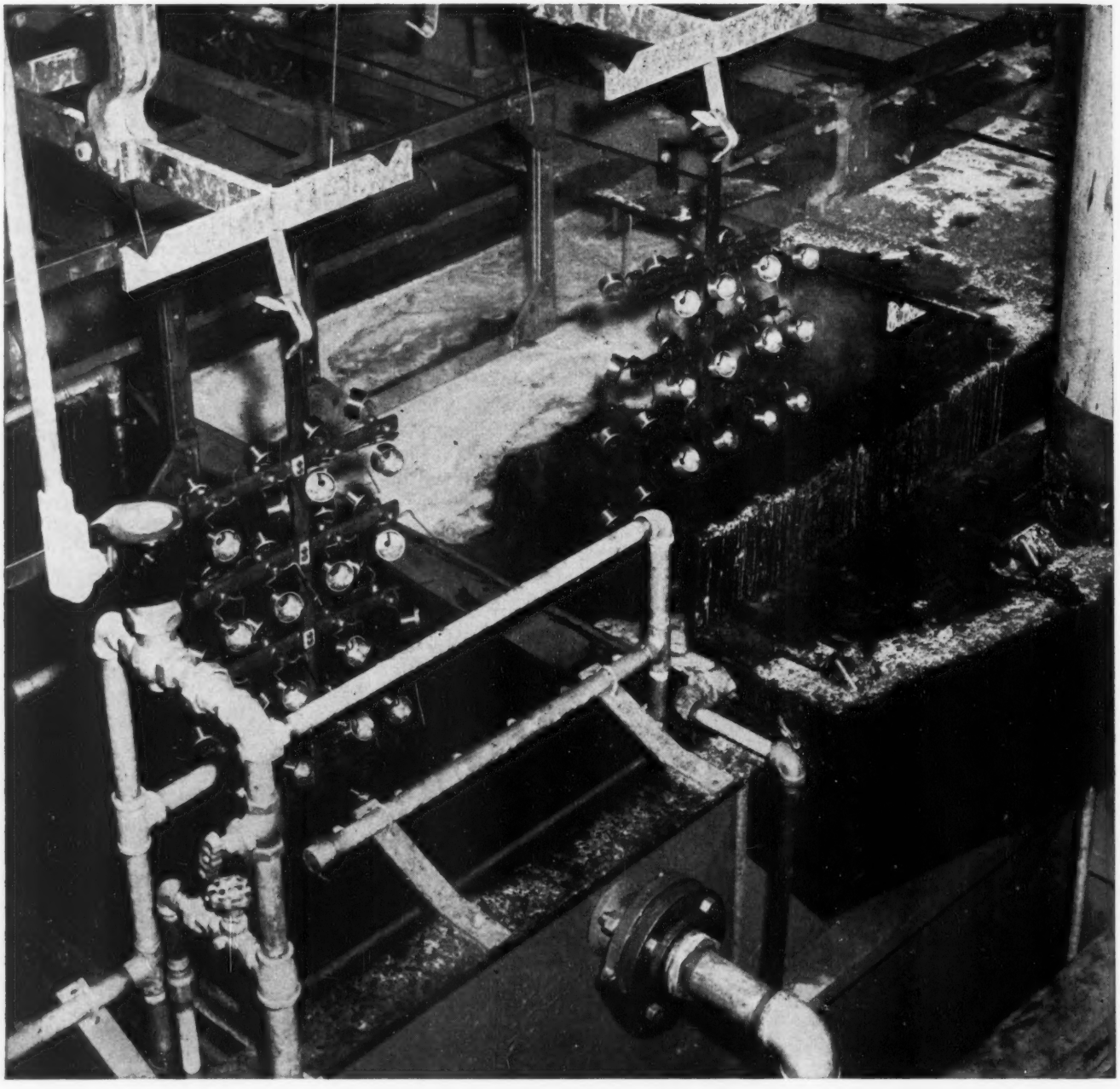
U. S. Patent 2,690,997. *Oct.* 5, 1954. *G. W. Jernstedt, assignor to Westinghouse Electric Corp.*

An improved aqueous copper cyanide electroplating electrolyte comprising from 0.01 to 0.4 ounce of lithium per gallon of the electrolyte, the lithium being dissolved in the electrolyte.

Silver Cleaning and Polishing Composition

U. S. Patent 2,691,593. *Oct.* 12, 1954. *S. Z. Avedikian.*

A silver cleaning and polishing composition comprising a creamy paste of the following approximate proportions by weight; 50 parts of emulsifying agent comprising sulfated, ammonia-neutralized castor oil fatty acids; 248 parts of a 50-50 mixture of two highly refined, straight run, petroleum naphthas, one having a flash point of 100°F. (minimum), with initial and final boiling points of 310°F. and 385-395°F.; the other a flash point of 140°F. (minimum), with initial and final boiling points of 356°F. and 493°F.; 100 parts of abrasive comprising an approximately 50-50 mixture of two grades of diato-



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Method of Producing Decorated Aluminum Articles

U. S. Patent 2,691,627. *Oct.* 12, 1954. *R. E. Johnson, assignor to Scovill Mfg. Co.*

The method of decorating an exposed surface of an aluminum article which includes depositing an oxide coating over the entire surface by anodic treatment, sealing said oxide coating to render it impervious to dyes, then mechanically cutting through the oxide coating and into the aluminum material by an edge cutting tool to a prescribed intaglio design, re-anodizing said article to deposit an oxide coating on said cut surfaces and dyeing said second oxide coating to provide a color in the design contrasting with the color of the remainder of said surface.

Pickling Process

U. S. Patent 2,692,187. *Oct.* 19, 1954. *A. E. Chester and J. T. Irwin, said Chester assignor to Poor & Co.*

A process of conditioning ferrous metal surfaces which comprises immersing the ferrous metal surface to be conditioned in an acid pickling bath containing a chromium aldonate and a compound capable of liberating elemental colloidal sulfur, the quantity of said last named compound being effective to liberate colloidal sulfur in a sufficiently small amount to remain dispersed in colloidal form.

SCIENCE FOR ELECTRO-PLATERS

(*Concluded from page* 69)

the presence of electrons (negative particles) in the nucleus would neutralize the additional positive charged particles, thereby satisfying the requirements for a stable neutral atom. This view gained support because beta particles (electrons) seemed to be ejected from the nucleus of radioactive elements. However, this theory was not entirely acceptable because the stability of such a closely packed system could not be satisfactorily explained. The proposal that a neutral particle, a combined proton and electron, could exist in the nucleus was made by several scientists in 1920. That such an arrangement for a stable nucleus was plausible was shown mathematically (wave mechanics) by Heisenberg after the existence of the neutron was announced by Chadwick in 1932. A modified form of this theory has been accepted as the basis for the modern view of the nucleus of the atom.

The neutron would thus have a mass close to one. The number of neutrons in the nucleus would be equal to the difference between the atomic weight of an element and its atomic number.

Atomic weight — Atomic number = Number of neutrons. A table including the first ten elements of the periodic table will demonstrate this arrangement. (Table 3)

The rule, that the nucleus holds approximately the same number of neutrons as protons, does not hold for the heavier elements. For example, the nucleus for the element uranium with an atomic weight of 238 and an atomic number of 92 would contain 146 neutrons, a value far in excess of the number of protons. 238 — 92 = 146 neutrons. This larger number of neutrons, compared to protons in the nucleus of these elements of high atomic weights, is associated with the observed instability of these element. The radioactive character of these heavier weight elements is evidence of this property. About forty examples of such natural radioactive elements were identified and classified by 1911.

TABLE 3

Element	*H*	*He*	*Li*	*Be*	*B*	*C*	*N*	*O*	*F*	*Ne*
Atomic weight	1	4	7	9	11	12	14	16	19	20
Nucleus										
Atomic No. (protons)	1p	2p	3p	4p	5p	6p	7p	8p	9p	10p
Neutrons	0	2n	3n	4n	5n	6n	7n	8n	9n	10n

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ABSTRACTS

Tin Coatings on Ferrous and Non-Ferrous Metals

G. Bianchi: *Metallurgia Italia.* Vol. 46, No. 4, pp. 141-149.

The characteristics of tin of very easily forming adhering coatings on the surface of steel and other metals is associated with the formation of intermetallic compounds and solid solutions of tin with the base metal. Surface occlusions as, for example, oxides and sulfides, hinder the wetting of the base metal and give rise to porous, defective protective coatings. In the corrosion protection of iron by tin, anodic and cathodic inhibiting phenomena also play a role.

Tin coatings on copper are distinguished from those on iron by the more noble base metal. In this case, the anodic or cathodic inhibition or the formation of insoluble or complex tin compounds does not occur. On the others hand, Ca or CO_2 dissolved in water, in combination with a surface coating on the tin deposit, can cause a reversal of the polarity of Cu-Sn which leads to local pitting corrosion of the copper. A superficial green coloration of the tin coating on copper, which sometimes occurs, originates from Cu/Sn compounds which are formed during the tinning stage by local super-heating (welding, too high a tinning temperature). The quality of the tin coating is most suitably determined by the porosity test.

Building-Up Worn Machine Parts with Iron Plating

By M. P. Melkov: *Vestnik Mashinostroeniya* (Russia). Vol. 33, No. 3, pp. 50-54.

An iron plating bath was utilized which contained in grams/liter: 500 ferrous chloride, $4H_2O$; 50 sodium chloride and 0.5 HCl, prepared by dissolving steel borings in 50% commercial HCl. The worn machine parts are renewed by plating in this bath at 20 amp./sq.dm. at 90-95°C. The iron coatings had a Brinell hardness of 150-530 kg./sq.mm., a tensile strength of 45 to 60 kg./sq.mm. and an elongation of 4-18%. The adhesion of the

coating, according to the pretreatment given to the base metal, is 200-400 kg./sq.cm. The wear resistance corresponds to that of a 0.5% carbon steel. The iron coating can be chromium plated and case hardened.

Coating of Steel Surfaces with Tungsten from Chloride Atmospheres

G. N. Dubinin: *Doklady Akad. Nauk.* UdSSR (Russia). Vol. 84, pp. 693-96.

The effect of tungsten chlorides, which are obtained by heating ferrotungsten with HCl according to the equation $2(Fe,W) + 2(n+m)\ HCl \rightleftharpoons 2\ FeCl_m + 2WCl_n + (n+m)\ H_2$ on iron or steel surfaces, leads to a deposition of metallic tungsten. According to whether or not an excess of hydrogen is present, the reaction is characterized by the following equations:

$$(1)\ mWCl_n + nFe \rightleftharpoons nFeCl_m + mW$$
$$(2)\ 2WCl_n + nH_2 \rightleftharpoons 2nHCl + 2W$$

The presence of HCl besides hydrogen in the reaction atmosphere acts favorably on the tungsten deposition. Tests which were made on a steel with 0.03% carbon of size 15 x 25 x 3 mm. which was treated for 6 hours at 1,-300°C. showed after the treatment the following structure:

1. A 7 microns thick white surface coating with 65.3% tungsten which consisted of Fe_7W_6 and had a microhardness of about 500.
2. A 45 micron thick middle layer with 12.0% tungsten, consisting of a solid alpha-solution and Fe_7W_6; the hardness of this layer was 165.
3. An innermost zone, which was 348 microns thick, contained 4.5% tungsten and consisted of coarse grained solid alpha-solution with a hardness of 141.

The structure of the surface zone (1) corresponds to that calculated from the equilibrium diagram, but the tungsten content of pure Fe_7W_6 should be 73.8%. The middle zone does not agree in its composition with the equilibrium diagram. Steel with 1.03% carbon was strongly decarbonized up to a content of 0.3 to 0.4% carbon; further, signs of superheating were observed. The surface region of 270 microns thickness consisted of columnar-shaped crystals of the alpha solution with brilliant needles of Fe_2W_2C and Fe_7W_6 in the grain

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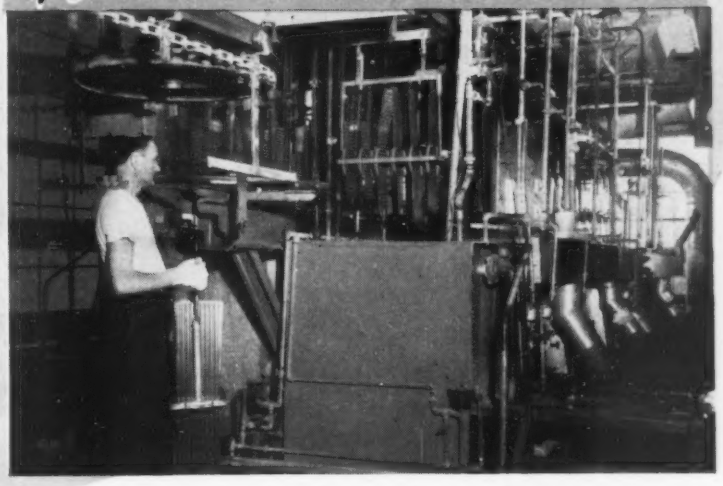

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boundaries. The tungsten content of this zone was about 19% and the hardness was 229. A diffusion zone of Fe_2W could not be established. The tungsten content sinks slowly at first with increasing distance from the surface up to 0.4 mm. and, after this, falls sharply away almost to 0 at 0.45-0.5 mm. At 1,100-1,200°C. carbide formation occurs to a greater extent. The heat resistance of the test parts between 900 and 1,100°C. was not changed by the tungsten treatment but, on the other hand, the corrosion resistance against 26% H_2O_2 with iron and 0.47% carbon steel and against 37% HCl and 50% HNO_3 with iron, was improved.

The following papers were read at the first plating conference of the Tin Information Bureau, Dusseldorf, held at Essen, Germany, October 1954.

Electrolytic Separation Forms of Metals in Theory and Practice

By H. FISHER

The author classifies the metals which are deposited from an aqueous solution into the categories of normal, sluggish and average metals. According to the type of metal, four different types of deposition are given. The separation forms can be induced in a favorable direction by the addition of inhibitors, and by complex formation for technical purposes for individual metals. Electrodeposited tin alloys have the advantage that they can be deposited out in a bright condition and with a lower porosity. They are considerably harder than the electrodeposited pure metals.

Electroplated Tin-Copper and Tin-Lead Deposits

By F. R. MERTENS

The Nickelex process works with a copper cyanide-sodium stannate bath. The Lustralite baths are based on stanno-pyrophosphate-copper cyanide. As a result of the same values of the potentials, copper-tin alloys can be deposited without any practical difficulties. There can be differentiated coatings with 7-13% tin corresponding to the normal bronzes, 17-22% and 40-50% tin. The low tin-containing coatings can replace copper and nickel plates before chromium plating.

With alloys of 40-50% tin, one arrives at what is termed Speculum, which now finds considerable application in place of silver plating, on account of its high resistance to discoloration and the hardness of the plate. The chief field of application of the electrodeposited lead-tin alloys from fluoborate baths are for bearings and as protective coatings for pistons and piston rings.

Electroplated Tin-Zinc and Tin-Nickel Alloys

By J. CUTHBERTSON

These two electroplated alloys have been brought to the commercial development stage by the research conducted by the (British) Tin Research Institute and introduced to industry. The tin-zinc alloy with 80% tin is deposited from a sodium stannate-sodium zinc cyanide bath. There are about 30 installations in operation at present, plating this alloy. The advantage of this tin-zinc coating is a high corrosion resistance with low porosity and good soldering characteristics as compared for example, with pure zinc coatings. For these reasons, considerable use is made of this plate for radio chassis, auto hub caps, etc. As this tin-zinc coating has almost the same electrochemical potential as aluminum, scarcely any corrosion trouble at all occurs with the assembly

of aluminum with tin-zinc plated steel screws and bolts and nuts.

While the tin-zinc coatings have already achieved a firm footing in the plating industry, tin-nickel alloy is a new type of decorative, corrosion-resistant coating which, on account of its warm color, has a more acceptable appearance for decorative purposes than the hard blue of chromium. A coating with 65% tin is deposited from a solution of stannous-chloride, nickel chloride, sodium fluoride and ammonium bifluoride. The bath has a very high throwing power. On polished metals there is obtained a brilliant deposit. The field of application for this plated alloy is principally household articles and tableware of all types, automobile parts, and parts for the building industry.

Electroplated Tin Coatings

By B. KEYSSELITZ

The advantages and disadvantages of the alkaline stannate and the tin sulfate plating baths are compared, these being representative of the tin plating baths in normal and extensive use in industry. The stannous chloride-caustic potash bath which once had some considerable popularity, is no longer used today, on account of the disadvantages which attach to this particular bath.

The most important field of application of the plated tin coatings is represented by the production of tinplate sheet and, today, more than 50% of the production of tinplate is electrotinned sheet. Modern electrotinning lines have a capacity of up to 250,000 tons of tinplate per year, utilize current capacities of up to 300,000 amp. and operate at strip steel speeds of up to 800 meters/minute. Special advantages attach to the electroplated tinned sheet as compared with hot-dip tinplate sheet.

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FINISHING POINTERS

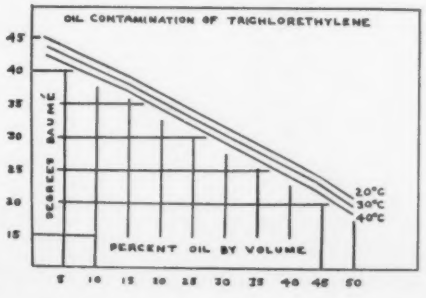
(*Concluded from page* 66)

ment is rapid, accurate and not restricted to a reading during operation.

Since there is a considerable difference in the gravity of oil and trichlorethylene a small amount of oil will readily effect the gravity of the solvent. Consequently the gravity reading is dependable.

The graph shows gravity readings for oil of 0.90 specific gravity. The specific gravity of oil does not vary greatly, so this may be used as a standard for the oils ordinarily accumulated in a degreaser.

The effect of temperature should be taken into account. The graph contains three lines so that a correction can be made as long as the temperature is between 20 and 40°C. The sample should either be cooled to this range before taking a reading, or a set of standards should be checked at other temperatures to determine the temperature correction.



The reading is sufficiently simple that the degreaser operator can make checks right at the equipment. A sample is dipped out, allowed to cool and a hydrometer dropped in it.

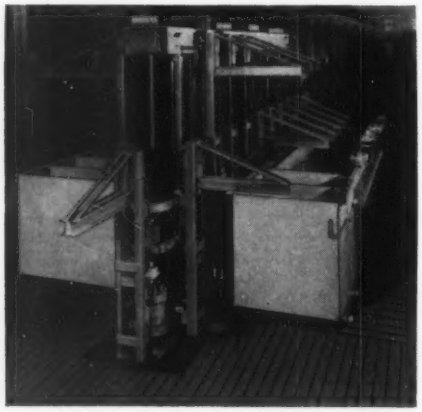
If gravity readings are taken at regular intervals and entered in a log it will be possible to predict when a certain oil content will be obtained. This will also make it possible to plan for distillation and cleaning of the degreaser in advance. Maintenance of the equipment can then be most conveniently planned to coordinate with a break in the production schedules.

Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES

Automatic Plating Machine

Frederic B. Stevens, Inc., Dept. MF, Detroit 16, Mich.



Details of the new "Stevadoer" automatic heavy-duty plating and processing machine designed to complement the existing company line of automatic plating and processing equipment are now available.

This new side arm type machine was engineered around an "automation concept" that will enable automatic loading and unloading. It can be adapted to single or double row plating and processing and was designed to handle almost unlimited rack sizes and extreme weights. However, only a minimum amount of height and floor space is required.

The delayed set-down mechanism which provides independent timing in one or more tanks can be provided. The machine is mechanically flexible —additional transfers can be easily provided. Through the use of a special timer control, a carrier arm can be made to skip any particular tank or operation as desired.

Safety and accessibility combined are added features. A 20 inch or wider cat walk can be provided between processing tanks and the mechanism on two-row machines. This permits safe and easy addition and removal of anodes, lubrication and inspection. No moving mechanism is over the solutions and all internal mechanisms are built below tank level. As a result, contamination of solutions from excessive lubrication and metallic wear is eliminated. Likewise damage resulting from corrosive fumes is reduced since moving parts are not in areas subject to attack.

All lift and horizontal motion is accomplished by hydraulic power. Special controls permit independent adjustment of acceleration and transfer speeds to accommodate all extremes of weight and rack size.

Filter for Alkaline Solutions

The Lea Manufacturing Co., Dept. MF, 16 Cherry Ave., Waterbury 86, Conn.

The Clean-Flo filter is a new portable type for clarifying alkaline plating solutions and other alkaline type liquids, without the need of filter aids. Two models are available—Economy and Standard—each offering the same flow rates. The former will handle from 100 to 150 gallons of activated carbon treated solution between tube changes; the larger standard unit from 500 to 1,000 gallons. The Moyno pump, used on these filters, delivers up to 800 g.p.h. against zero p.s.i. back pressure and from 500 to 600 g.p.h. against 50 p.s.i. back pressure.

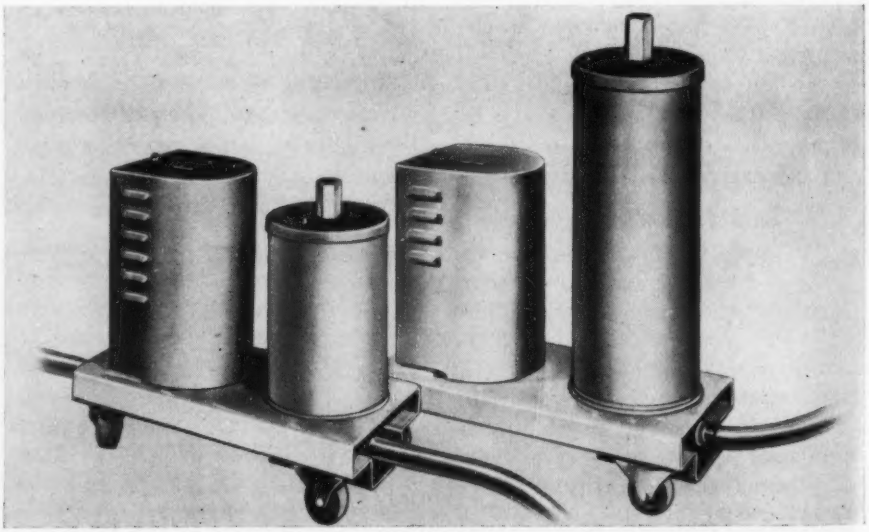
The principle involves the use of filter tubes of special honeycomb construction providing "depth filtration" with minimum clogging effect.

The hard-chromium plated stainless steel impeller rotates in a soft synthetic rubber stator and is self-lubricated by the liquid being pumped. A self-adjusting rotary seal on the shaft operates under pressure, preventing leakage and reducing the possibility of solution aeration. Positive flow provides smooth, non-vibrating action, reducing turbulence to a minimum.

In contrast with conventional surface type filters which tend to build up back pressure quickly and come to the end of the filtering cycle at about 15 to 20 p.s.i. pressure, the new filter, with its depth filtration, builds up back pressure slowly. The pump can deliver 75% of its rated flow at 50 p.s.i. back pressure. When this point is reached, an automatically operated "blinking light" indicates when filter tubes should be changed. The filter is then opened up and a new set of filter tubes inserted.

The self-priming pump is assembled with the filter to provide a compact portable unit, protected from splashing and mounted on a base with wide swivel type casters, providing great portability.

The motor, also assembled with the



unit, is a ½ h.p., 115/230 volt, single phase, 60 cycle capacitor unit with a 10 ft. heavy duty extension cord and plug. (Optional 440 volt, single phase, 60 cycle motor.) Two 10 foot lengths of ¾ I.D. chemically resistant fluid hose complete the assembly.

Technical Information Bulletin No. 109 which describes the filter in more detail will be sent on request direct to the manufacturer.

Germanium Rectifiers

Rapid Electric Co., Dept. MF, 2881 Middletown Road, New York 61, N. Y.

Available in several models from 300 to 50,000 amperes D.C. output, new germanium rectifiers are designed to outlive all conventional types of D.C. power supplies, and offer 95% efficiency at full load, according to the manufacturer. In voltage stabilization tests on the new units, a minimum voltage variation of less than ± 1 volt has been maintained when operating from no load to full load.

Oil immersed, fully motorized continuously variable, inductor controls are furnished to vary the output from zero to full rated load at the touch of a button. The complete rectifier units are almost 100% completely sealed from adverse atmospheric conditions. The germanium junctions are hermetically sealed. Because the use of elaborate fans and cooling systems has been eliminated, the units are considerably smaller physically than conventional units.

Full information is available in a booklet entitled "Presenting Germanium Rectifiers" which is available by writing to the manufacturer at the above address.

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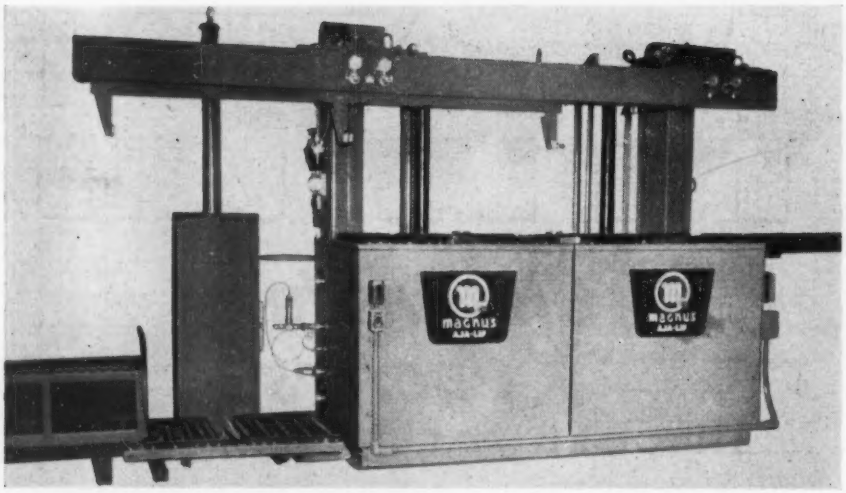
TECHNIC INC.
Providence, Rhode Island, U. S. A.

Multi-Compartment Tank

Schori Process Div., Ferro-Co Corp., Dept. MF, 8-11 43rd Road, Long Island City 1, N. Y.

Four plating tanks, recently installed in the plating department of the Bulova Watch Co., are newly designed of a chemically resistant laminated fiberglass called Iolyte. The manufacturer claims this material is as strong as steel, pound for pound, although only one-fifth its weight, and resistant to all chemicals used in plating plants. Also that it may be fabricated to any specifications, in any shape or size. No molds are needed.

Used for watch dial plating, each tank serves a different function, numeral plating, preparation for silver plating, color plating, and acid line. Approximately 10′ x 3′ x 3′, each tank has up to 12 compartments for dip and spray rinses. Compartments are designed to provide a continuous flow of fresh water for dip rinses. The



NOW – Batch dip cleaning... ...Automatically!

Through the elimination of manual handling, this new Magnus "Aja-Lif Automatic" cleaning method makes processing of work in baskets more advantageous than ever before.

Designed for any number of operations, the machine is fully automatic and can be used with solvent, alkali or acid solutions. It is available in either straight line or U-shape to fit in any production line.

The Magnus "Aja-Lif Automatic" has two unique features: "Air lift loading" which automatically raises the work to the top of the machine, and "nu-matic push device" which positions the baskets of work for each stage of cleaning and following operations. Cleaning is automatically accomplished by vigorous agitation of the work in the solution. All motions are performed by air power.

Before committing yourself to any type of cleaning equipment, it will be to your advantage to investigate this new cleaning method.

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Equipment Division

MAGNUS CHEMICAL CO., INC.

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tanks have from one to three inlets and drains instead of one inlet and drain for each compartment, facilitating the plumbing problem. Provision is made for agitators and steam coils. The outsides of the tanks are clad in stainless to conform in appearance with the other modern equipment in the plant.

Filter

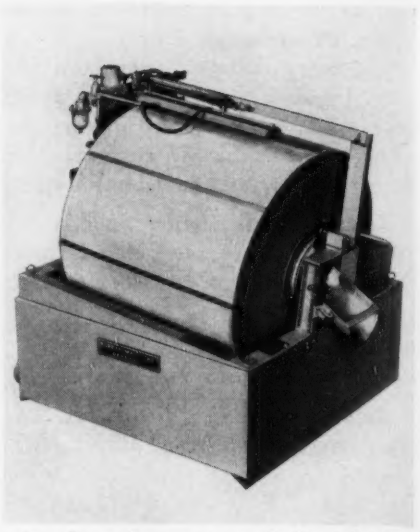
The Murray-Way Corp., Dept. MF, Birmingham, Mich.

An improved automatic filter for all types of industrial filtration, known as the Model 10, features basic improvements in the removal of the contaminant, elimination of tuning rods, and an enlarged filtering area.

The filter automatically rotates fresh filtering area into position while simultaneously ejecting the contaminated cake. Filtering screen is divided into eight equal parts, screw-mounted. Filter screen material and size of screen opening can be supplied in Monel, stainless steel, brass or bronze to fit all requirements.

Contaminant retained on the filter screen is removed by air pressure and is dropped directly into the exit chute. Through the filter float control the air unit is actuated only when the drum turns. That operation occurs only when the contaminant cake restricts filtering and the liquid level rises to operate the float control.

Elimination of the tuning rods permits the enlargement of the filtering area approximately 15% without enlarging the small floor area already occupied.



The filter may be used on an individual machine unit, or as a central filter for many units. The gallon capacity of filtration may be easily increased by adding filter drums in tandem, separately, or in the same tank to meet requirements.

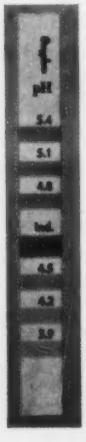
Masks and Rack Coats

Chem Products, Inc., Dept. MF, Silas Deane Highway, Rocky Hill, Conn.

The above firm offers a new series of rack coatings claimed to have better plating stop-off and longer rack life. The masks and rack coats are especially formulated and are available in air-dry, hot-melts, and baked types. According to the manufacturer, all are designed to meet the rigid requirements and varying conditions of the plating industry.

pH Papers

True Brite Chemical Products Co., Dept. MF, Oakville, Conn.



Oxyphen pH Papers provide a new and simpler method of testing pH rating of electroplating solutions. No separate color charts or comparison charts are needed with the new type papers which provide an instantaneous reading of the pH rating when the color of the indicator bar is compared with the nearest constant color bar.

Thirty separate ranges are available to cover all of the practical conditions of pH

ratings from acid copper solutions (0.3 to 1.8) to cyanide copper solutions (11.5 to 14.0).

pH papers are packaged in a plastic box which fits inside a shirt pocket. Each box holds 200 papers and as many as six different ranges can be carried at one time, each of which is readily identified through the plastic cover.

Oxyphen pH papers are handled through leading distributors or by direct order to the above company.

Combination Cleaner-Deruster

Oakite Products, Inc., Dept. MF, 119 Rector St., N. Y. 6, N. Y.

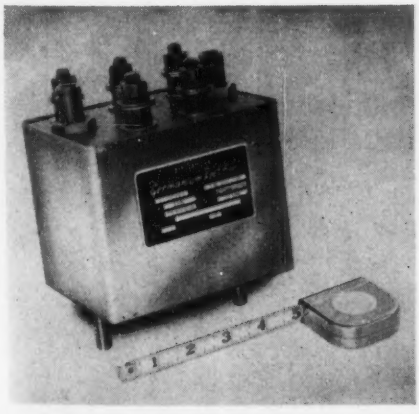
Oakite Compound No. 131, a new acid detergent designed primarily for pickling and scale-removal operations in metal-working plants, is reported to remove light to moderate rust, heat scale, tarnish, and other oxides, as well as normal shop dirt; and to meet specification MIL-M-10578A, Type III.

The compound is a non-viscous, amber colored liquid product having a pH range of 1.5 to 1.0 at 70°F., and a bulk density of 11.0 lbs. per gallon. It is completely and readily soluble in water or alcohol in all proportions, and is said to possess excellent rust- and soil-removing properties as well as effective inhibition for iron and steel. It rinses easily in both hot and cold water. It may be used in a concentration range of 5 to 30% by volume, with solutions made by stirring the compound slowly into the full volume of water. Recommended operating temperatures range from room temperature to 160°F.

Liquid-Cooled Germanium Rectifier

International Rectifier Corp., Dept. MF, El Segundo, Calif.

This new 35 KW liquid-cooled germanium power rectifier, Type 53-00-75-0, is a 3 phase bridge unit, rated for a maximum of 450 amps. DC continuous output and can be supplied for input voltages of 26 V, 36 V, 52 V and 66 V RMS maximum.



The unit has a volume of approximately 220 cubic inches as compared to 1650 cubic inches for a comparable selenium unit (fan cooled) and 14,000 cubic inches for a copper oxide unit (fan cooled), it is claimed. It requires liquid coolant (water, oil, etc.) at a maximum inlet temperature of 25°C. and a volume of ½ gallon per minute minimum.

Efficiencies up to 97% are attainable and the power factor is essentially 100%. Aging is negligible or zero. Rectifier regulation as low as 2% is possible from no load to full load, according to the above manufacturer.

The new rectifier is applicable for all types of DC load requirements except those requiring heavy surge currents and those subject to heavy intermittent overloads or occasional short circuits. Sizes of this unit may vary slightly with ratings.

Distilled Water Bottle Pump

Barnstead Still & Sterilizer Co., Dept. MF, 2 Lanesville Terrace, Forest Hills, Boston 31, Mass.

A new bottle pump for the removal of distilled water and other liquids from carboys, tanks, etc. is designed to protect contents at all times from contaminating matter which may enter during time of storage or when liquids

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Addition Agents for acid cleaners: PROMAT 7073 and 7076.
RESULT: Clean, oxide-free surfaces for electrodeposited metals.

Addition Agents for cyanide and acid zinc plating solutions: C-42, B-4, B-4M, 6550 & 6555.
RESULT: A uniform deposit of fine grained zinc with exceptional luster and protective value.

Addition Agents for cyanide copper plating solutions: PROSALT.
RESULT: A fine grained deposit—excellent for selective hardening and as a base for decorative finishes.

Addition Agents for cadmium plating solutions: C-5028-S.
RESULT: A deposit with high luster and long time protection against corrosion.

Chromate Conversion Coating — The PROSEALS.
RESULT: The ultimate in protection for electrodeposited zinc and cadmium and alloys of aluminum, zinc and copper Available in olive drab, bronze and bright phases.

White and Yellow Brass — PROBRITE and PROSALT.
RESULT: A full bright highly protective decorative finish which is unaffected by metal allocations.

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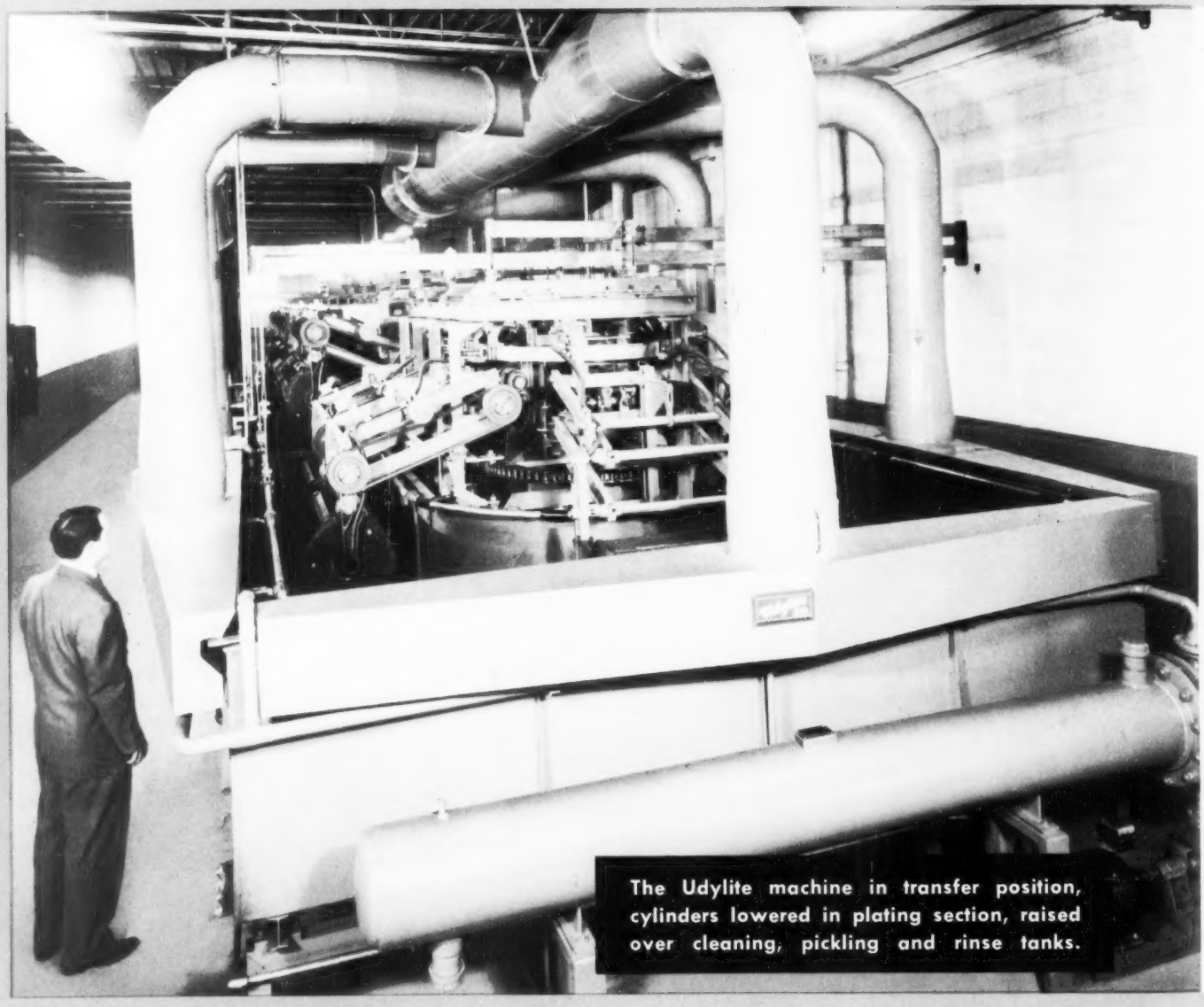


The Udylite machine in transfer position, cylinders lowered in plating section, raised over cleaning, pickling and rinse tanks.

THIS is the new Udylite full automatic barrel plating machine. A heavy duty, high production, return type unit, designed and built for any standard plating process. It uses any of the standard Udylite barrel plating cylinders.

Udylite's years of experience as the leading manufacturer of barrel equipment along with more than four years of development of this new machine bring many design features new to the plating industry.

With the Udylite full automatic barrel plater you get excellent tumbling conditions with uniform distribution of deposit as is inherent in plating with horizontal cylinders. It is flexible, and gives high productivity with specification plating.

Here are additional features: The cylinders may be operated at different speeds. As an example—one speed in cleaning and plating and a much slower speed in dichromating and subsequent tanks.

Electrically and mechanically operated, the machine is designed so that none of operating mechanism is over the tanks except the vee-belt drives. Three electrical timers located in the control panel regulate the number of cylinders per hour, the delayed set-down and the dwell when the cylinders are raised out of the tanks.

Cylinders may be left in the "Up" or "Down" positions indefinitely—all regulated from the control panel. The cylinders also rotate in the "Up" position before transfer, reducing the drag-out to a minimum.

The lift mechanism allows for the raising or lowering of any cylinder at any station independently of the rest of the cylinders. The machine may be pre-set for a given cycle within its range, but all cylinders need not follow the same cycle.

The Udylite automatic barrel plating machine offers the maximum in economy and service and the minimum in maintenance.

THE NEW *Udylite* AUTOMATIC BARREL MACHINE

FLEXIBILITY

Any cylinder at any station is potentially capable of being raised or lowered independently of the rest of the cylinders. This is accomplished by delayed set-down or skip mechanisms. The machine may be pre-set by the operator for a given cycle within its range, and all the cylinders need not necessarily follow the same cycle. The number of cylinders per hour is controlled by the setting of the electric timer.

SPECIFICATION PLATING

The machine may be set for a given thickness of deposit on so many square feet of work per cylinder load. The relationship between weight and surface area of the work may be established from a system of charts, and a given weight is put in the cylinder. The weighing scale at the loading station measures the load.

HIGH PRODUCTIVITY

The given load is placed in the cylinder and the machine set for so many cylinders per hour, and the production is constant. To assist in faster plating, truly conforming anodes are used, and for zinc and cadmium solutions, the anodic charge is made at the bottoms of the anode containers as well as at the hooks.

LOADING

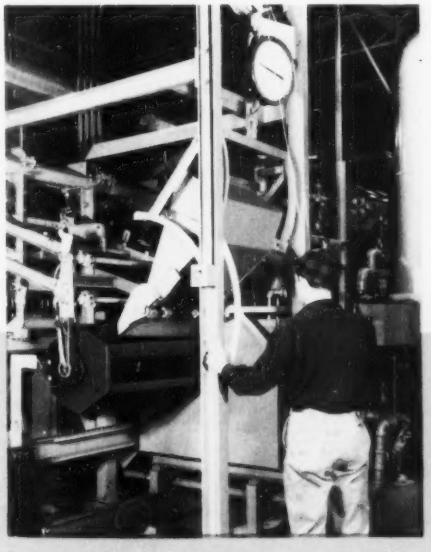
Loading is accomplished by a power operated hoist which raises the load and discharges it into a cylinder. A weighing scale is used in connection with the loading.

CYLINDERS

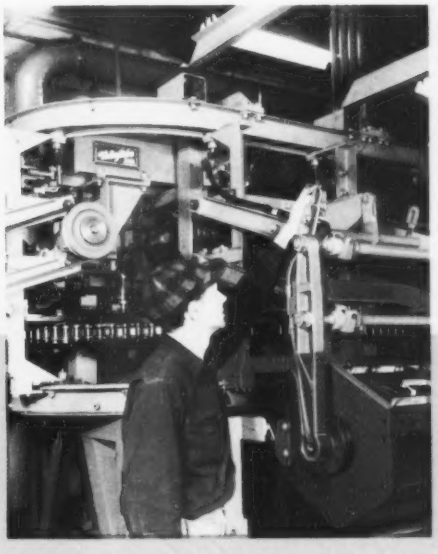
Cylinder size is 14″ x 30″. They are very easily removed from the machine. Tumbling of the work "across" the cylinder is uniform because of the horizontal rotation and this is conducive to more uniform distribution of plate from part to part within the load. The cylinders themselves, being made of either Tempron hard rubber or acrylic resin (Lucite or Plexiglas) have excellent abrasion resistance.

CURRENT

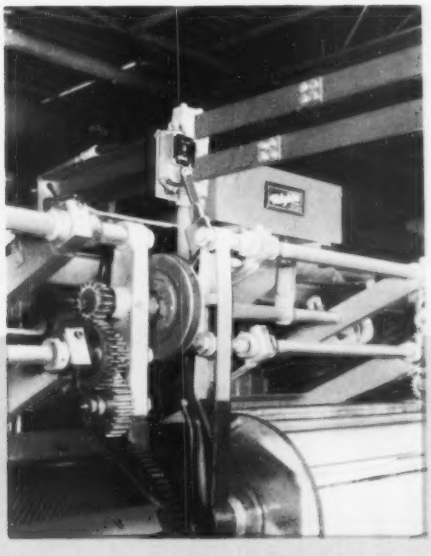
The machine is equipped with Udylite Selenium Rectifiers. In the unit illustrated two rectifiers are used. One is 1500 ampere, 12 volt for the electrocleaners and reverse cyanide. The second is 7000 ampere, 12 to 15 volt for the plating tank. With eight cylinders plating this gives 875 amperes per cylinder. The machine may be bussed for 1000 amperes or more per station.



A view taken from the loading end of the machine. Here you will note the power-operated loading chute, the hoist, the weighing scale and the Tempron hard rubber plating cylinder. Only one man is required to operate the machine.



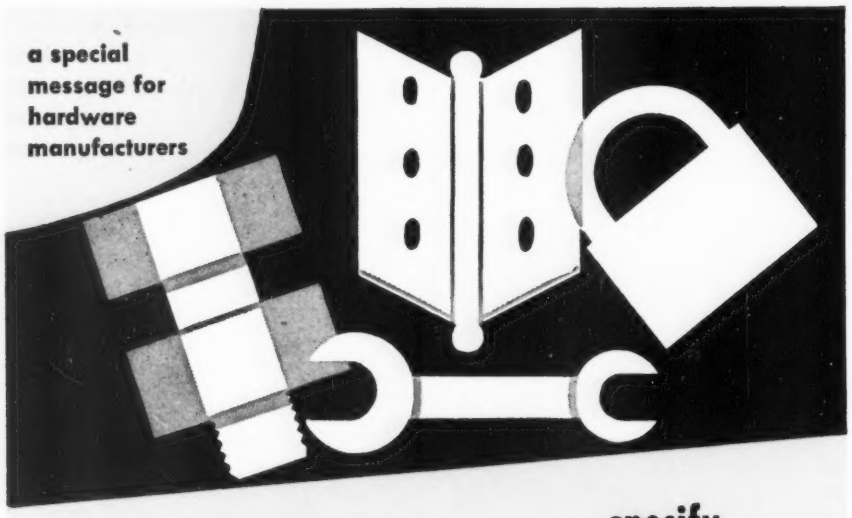
Operator setting skip transfer mechanism. Any cylinder at any station can be raised or lowered independently of the rest. The machine may be pre-set for a given cycle within its range, and all cylinders need not follow the same cycle.



Mechanism pre-set by the operator is here shown tripping the limit switch activating the panel board timer to delay the cylinder immersion or to hold the cylinder in the "Up" position for transfer without immersion at this station.

World's Largest Plating Supplier

THE *Udylite* CORPORATION
DETROIT 11, MICHIGAN



need a finish for protection—decoration—identification? specify IRIDITE®

Specify Iridite . . . for corrosion protection during storage or use . . . for a firm and lasting base for paint . . . for extra quality and eye-appeal . . . for low cost color coding of finished parts.

- **ON ZINC AND CADMIUM** you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.
- **ON COPPER . . .** Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.
- **ON ALUMINUM** Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.
- **ON MAGNESIUM** Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

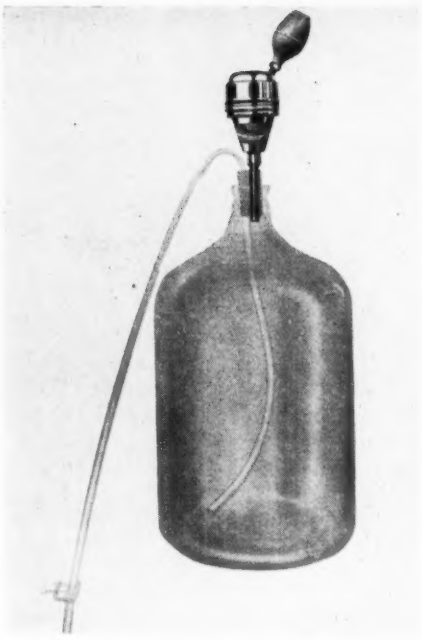
AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, ARP Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.



are being removed. The air which is forced into the container is automatically cleaned since it must first pass through the special Ventgard filter which removes and absorbs the various impurities before it can enter the container to replace the liquid being pumped out.

The specially designed filter element may be replaced after 1000 gallons of distilled water or other liquids have been pumped out thus making it an economical safety device to use.

Chemical Process Pumps

The Duriron Co., Inc., Dept. MF, Dayton 1, O.

The Series H Durcopumps is an entirely new line of heavy duty chemical process pumps designed for continuous operation and built for high heads and low capacities as well as routine transfer services.

The pumps are simple, sturdy, and versatile. They have been designed to handle the most severe pumping problems. A large shaft and heavy bearings provide minimum shaft deflection. Suction and discharge are integral with the casing. Minimum parts inventory results from the flexibility of the adaptor and the bearing housing. Each adaptor accommodates several pump sizes, and the entire range of sizes requires just three bearing housings.

The pumps are available in standard Durco corrosion resisting alloys including Durimet 20, Chlorimet 2, and Chlorimet 3, and in stainless steels and other materials. Basic details re-

garding these new pumps are contained in Bulletin P/8.

Tumbling Barrel

Minnesota Mining and Mfg. Co., Dept. MF, 900 Fauquier St., St. Paul 6, Minn.

A low-cost, standard-model barrel finishing machine with many features of the deluxe models has been added to the above manufacturer's line of barrel finishing equipment.

Called the VS model, the machine has all moving parts enclosed. Safety features include a pivot-mounted gate which closes when the machine is in operation, and a magnetic brake.

All lubrication points are readily accessible, since the motor, speed reducer, speed changer and brake are mounted in a single unit at the rear. The cylinder can be removed without disassembling the machine.

The new model has a steel frame, with oversize pillow blocks and self-

aligning bearings which are capable of carrying full loads of steel burnishing media, the company said.

In addition, there is a large amount of space underneath the barrel to facilitate rapid unloading, and all controls are front-mounted at a working height.

The machine is available in three power ranges, with a 1½ h.p. motor for ordinary requirements; a 2 h.p., motor for heavy duty work, or a 3 h.p. motor for extra heavy finishing jobs.

Stainless Steel Cleaner and Passivator

Concor Chem. Co., Dept. MF, P. O. Box 846, Hoboken, N. J.

Permapass is a liquid cleaner, applied by brush or spray, which removes acid stains, light weld burns, rust and free iron; cleans; degreases and passivates stainless steel surfaces in one application at room temperature. This product has been tested and approved by many of the basic stainless steel producers, according to the manufacturer.

The product is of interest to the fabricator as a final treatment to remove iron contamination and ensure best performance in cases where large parts and assemblies cannot be effectively treated by the conventional nitric acid passivation procedure. In the processing industries, it can be effectively applied to large items of equipment to ensure best performance in critical applications or to protect installations in corrosive atmospheres.

Passive films produced by the treatment are claimed to be equal or better in resistance to salt spray than those afforded by the regular hot nitric acid method.

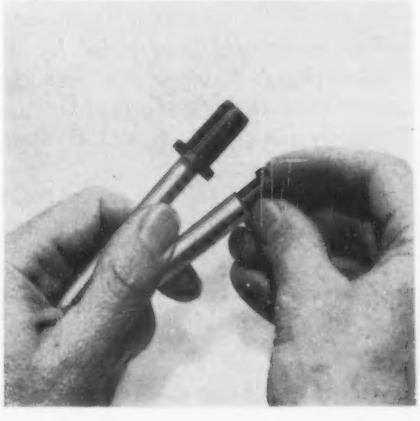
Protective Caps & Plugs

Ray A. Scharer and Co., Dept. MF, 3000 E. Grand Blvd., Detroit 2, Mich.

A new line of rubber and plastic protective closures for threaded parts, pipe and tubing ends is called Shurclose caps and plugs. The closures are inexpensive and have four main uses: (1) Protect threaded openings and connections against possible damage; (2) Prevent moisture or dust penetration; (3) Seal in gases and liquids; (4) Mask pipe or tube ends from paint spray and preservative finishes.

The caps and plugs are produced from high grade, sulphur-free, black rubber or, if required, from Neoprene, Hycar or natural rubber. There are four types and fifty sizes available as standard. As caps they accommodate a range of tubing from 1/16 to 2½ in. O. D., as plugs from 7/16 to 3 in. I. D.

Plastic caps and plugs are molded vinyl or polyethylene. They are flexible, tough and impervious to practically all commercial gases and fluids. Plastic caps do not chip, shred or break under very severe usage. Available in nineteen sizes as caps for tub-



THE FINISHING TOUCH

SURFACE FINISHING OF STAINLESS STEEL

by D. J. Swaninger
Sales Manager — Stevens Compositions

In our business we are frequently asked to recommend methods for polishing and buffing manufactured items long before these products reach the buying public. Noticeable lately, are the increasing requests for surface finishing information on stainless steel.

Finishing of stainless steels is much like that of gold and silver. They require no protective coatings to preserve them. When polished and buffed they have utmost corrosion resistance. There are these factors, however, that must be considered in finishing stainless steel. Greater hardness and abrasion resistance—less thermal conductivity—greater coefficient of expansion.

Stainless steel finishing operation using compositions and equipment supplied by Stevens.

This means that the type of buffs, the wheel speed, the pressure of work against the buff and the compositions used are of extreme importance. Otherwise there is the danger of discoloration, distortion or warping.

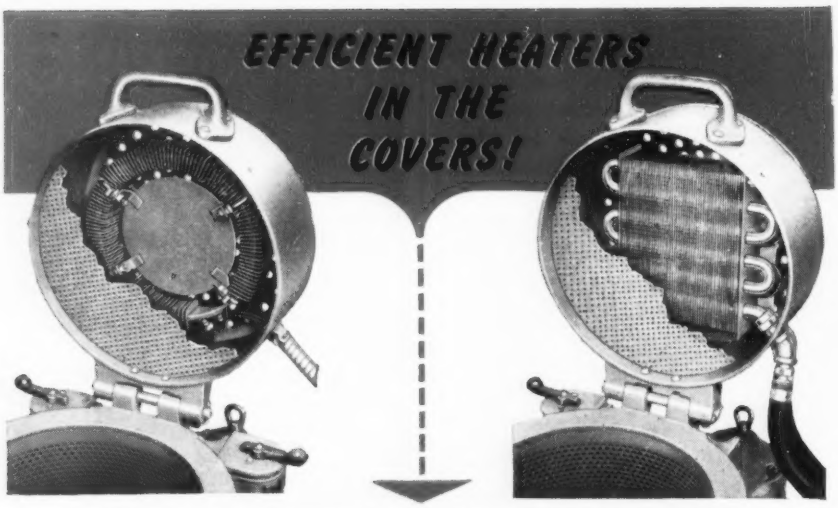
No set formula can be put down on paper for finishing of stainless steel. But by making hundreds of tests in the Stevens laboratory we have developed techniques and products that have enabled us to quickly solve finishing problems for many a manufacturer.

Inasmuch as we are suppliers of automatic finishing equipment, polishing lathes, buffs, wheels and Stevens compositions we can perhaps help you with a Stevens L. V.* Report. Write us, on your company letterhead describing your product, the finish desired and required production.

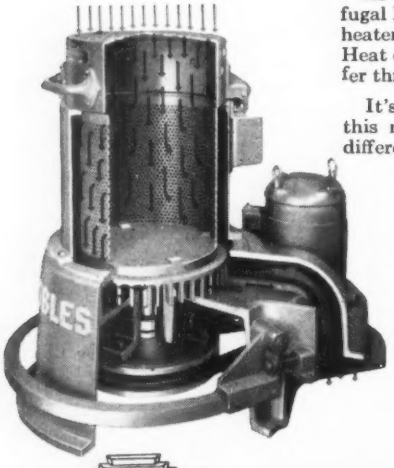
*Laboratory Verified

See the Stevens exhibit at the 4th Industrial Finishing Exposition, Cleveland, June 20 to 23. Booth No. 112.

FREDERIC B. STEVENS
INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN



FOR LOWER DRYING COSTS!



As optional equipment with any Nobles Centrifugal Dryer, you may have efficient steam or electric heaters safely and compactly mounted in the cover. Heat doesn't come from an auxiliary unit and transfer through pipes . . . it saves space, saves heat.

It's only one of many features you'll like about this machine of advanced design. It's completely different in principle. The old way was to *blow* air down at the parts. A powerful suction fan *draws* the air from the bottom of the modern Nobles Dryer. Fresh air rushes in from the top to fill the vacuum, is drawn evenly through the entire contents and exhausted at the bottom.

You'll like its extra weight, its smoothness, its freedom from vibration. As one user put it, "Certainly it depreciates less and requires less maintenance than any competitive product."

In the interest of lower drying costs, write for more information today!

NOBLES ENGINEERING & MANUFACTURING CO.

547 EAST SEVENTH STREET ST. PAUL 6, MINNESOTA

Write Today for the FREE NOBLES-DRYER BROCHURE

ing ranging from 1/8 to 1½ in. O. D. or as plugs from 3/16 to 1⅝ in. I. D.

Explosion-Proof Fractional Hp. Motor

General Electric Co., Dept. MF, Schenectady 5, N. Y.

A new explosion-proof fractional horsepower motor, designed for longer life and safer operation in hazardous atmospheres, and minimum maintenace, is constructed with heavy cast iron end shields for extra protection. Overbolt construction gives the motor assembly additional strength with little increase in weight.

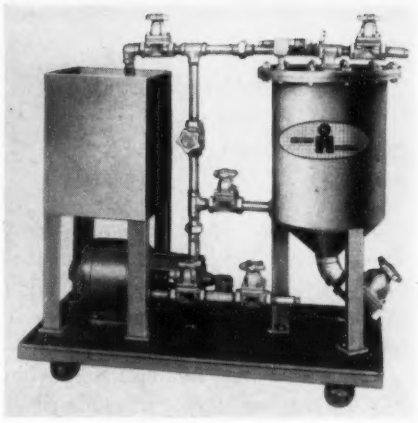
According to company engineers, the explosion-proof motor will give ten-years' normal service without relubrication. Use of a new ball-bearing grease, which is highly resistant to oxidation and moisture, makes extra long service with minimum maintenance possible, the engineers say.

The motor has been tested by the Underwriters' Laboratories and approved for Class I, Group D; and Class II, Groups E, F and G atmospheres.

Solution Filter

Hygrade Metal Fin. Div., United States Hoffman Machinery Corp., Dept. MF, 105 Fourth Ave., New York 3, N. Y.

This new self cleaning pressure filter



uses a stainless steel wire-wound cylinder which supports the filter media, is non-corrosive and speeds up the filtration process.

The filter's outstanding features are: a new backwashing device which accomplishes filter cleaning by turning two valves, filtration at high pressure (up to 125 p.s.i.) without leakage, tank capacities up to 5000 gal., and a longer filtration cycle made possible by the increasing density of the filter cake.

Costly maintenance and high labor costs are done away with according to the above manufacturers, because the filter requires no filter bags, sheets or pads. Carbon treating and filtering are performed in one operation instead of the batch treatment necessary with leaf and pad type filters.

Compactly designed, the complete assembly consists of pre-coating tank, splash proof electric motor, pump, filter pressure chamber, valves for suction and discharge flow, and a pressure gauge. The complete assembly can be mounted on a common base and transported to filtration areas anywhere within the plant.

Automatic Continuous Proportional Metering Systems

Applied Engineering Associates, Dept. MF, 1952 Flushing Ave., Brooklyn 37, N. Y.

Automatic continuous proportional metering systems for the processing of two or more liquid components in any desired range of ratios is claimed to be noted for mechanical simplicity, requiring a minimum of maintenance. It offers, at minimum cost, complete versatility for process requirements in the handling of all types of liquid chemical systems.

These systems will handle all ranges of viscosity, from water-like to non-

flowing pastes, without regard to viscosity differences in components being metered. Pressure feed of components to the systems is employed to insure component material flow and complete filling of each of the metering elements. Degree of accuracy of the systems is independent of material flow characteristics and will conform to the most stringent process requirements. Control of proportion is actuated by either component being metered. Pressurized feeding of material through the sealed systems prevents the introduction of air into the system. The systems can be used in conjunction with continuous or batch processing.

The materials being metered flow through the system at a rate commensurate with demand for materials. Throughout all rates of flow, the accuracy of proportion is constantly maintained.

The charges for the equipment, starting at $2,000, are dependent upon degree of automation, production capacity, and other details in the equipment design as requested to meet specific end applications.

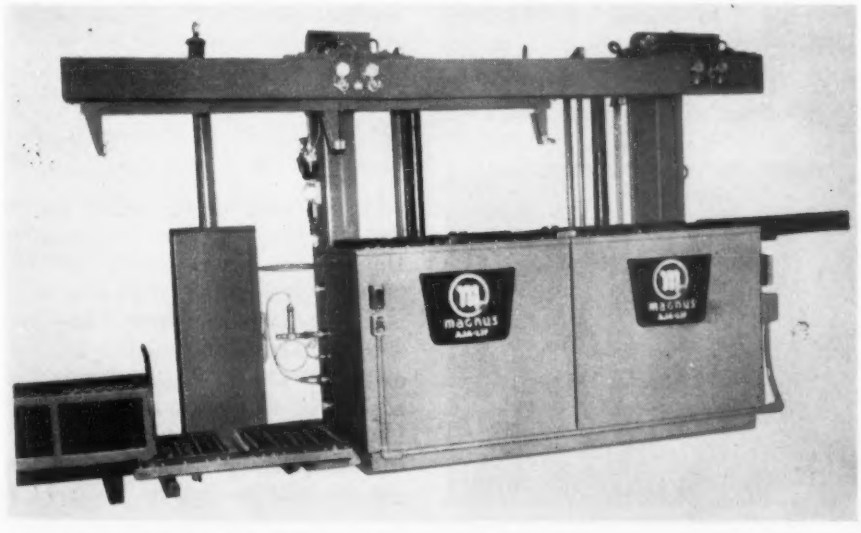
Cleaning Machine

Equipment Div., Magnus Chemical Company, Inc., Dept. MF, Garwood, N. J.

The above company has announced a new addition to its line of equipment using mechanical agitation of the work in the cleaning solution.

In this new development, the "Aja Lif Automatic" machine is equipped with "nu-matic push device" and "air lift loading" of the work.

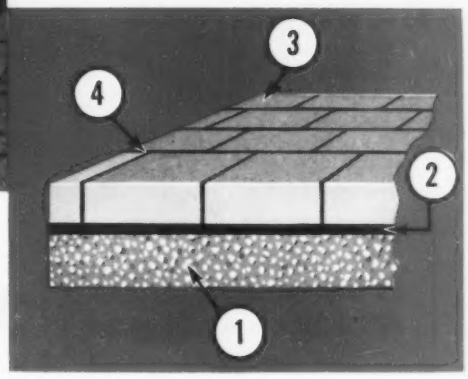
As illustrated in the photo, the work to be processed (generally in baskets), is pushed at floor level on to a lifting roller platform which automatically raises the work to the working level or top of the cleaning machine. At the same time similar roller platforms in each tank raise to the same level. Then a push drive device with collapsible dogs above the tanks transfers each basket or batch of work one step forward at each cycle.



By means of a synchronizing device, the platforms in each tank with the work on them are lowered in the cleaning solution and vigorously agitated for the necessary length of time, after which they will automatically rise again at working level. At this moment the push drive will transfer the baskets or loads one more step toward the right and the process repeats itself indefinitely.

The functioning is entirely auto-

Here's why this
PLATING ROOM FLOOR
will last for
FIFTY YEARS
or more!



. . . and will cost practically nothing for maintenance

1. It is built on a rigid, solid sub-base — 4" to 6" thick.
2. The sub-base is protected by a thick corrosion-resistant "Resilon" membrane.
3. Over the membrane, a course of dense, tough, spall-resistant "USSCO" acid brick.
4. Bonded by wafer-thin, non-porous joints with "Durisite" acid-and-alkali resistant cement.

Yes, here's a corrosion-resistant floor that will outlast the building itself. Expensive? Savings in maintenance, alone, will make it over the years the lowest cost floor you can install.

Write for this free booklet!

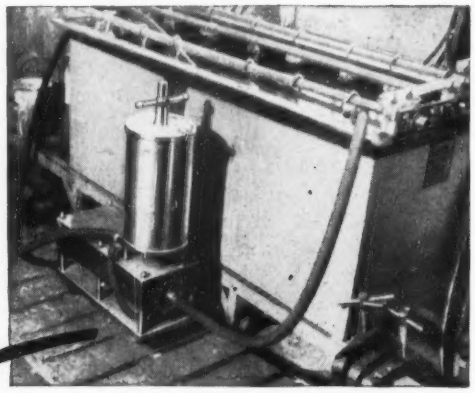
Detailed construction drawings showing approved methods of building floors, trenches, gutters, tank and motor supports, etc., with full technical data, photographs and case histories. Ask for Bulletin AB-17.

PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

AKRON 9, OHIO 89E

CHECK the advantages



of using a "Sealed-Disc" Filter

YOU'LL . . . . . be impressed too . . . . . with these proved performance features.

Models for any size or type installation in Stainless Steel, Monel Metal, Plain Iron, etc.

Small, compact — requires exceptionally small floor space coupled with remarkable filtering speed and volume.

Completely enclosed and air tight — eliminates loss of liquid from dripping.

"Sealed-Disc" Filters are complete as shown — slurry mixing tanks are not needed — filtering powders are not generally required.

Simplicity of design assures savings in operating time and labor with positive trouble-free performance.

Every plater who uses a "Sealed-Disc" Filter is impressed with it's positive, trouble-free performance.

Regardless of the size or type of your plating installation, there's a "Sealed-Disc" Filter "to fit your job" — you can depend on these proved performance features — you can be sure that all dirt, sludge, and even the invisible impurities are removed from your plating solutions.

"Sealed-Disc" Filters were designed especially to meet plating room requirements. They are smaller, more compact and portable than ordinary Filters, yet they are capable of handling equal volumes of solutions. Ask your regular plating supplier to tell you about the "Sealed-Disc" Filter that has helped so many platers get better finished plated work with savings in time and labor — or write for details.

ALSOP ENGINEERING CORPORATION

1005 Bright Street Milldale, Conn.

Other Alsop plating room equipment

We manufacture a full line of Mixers and Agitators covering a complete range of sizes, for mixing, blending and dissolving. Stainless Steel Mixing Tanks are also available in a wide range of capacities. For full details and illustrations write for your free catalogue.

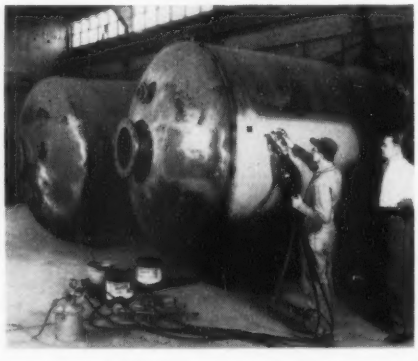
matic. The equipment is air powered.

The machine can be designed for any number of operations and for use with solvents, alkalies, or acids. It requires no special foundation and can be installed in any existing production line.

Spray Vinyl Coating

Prufcoat Laboratories, Inc., Dept. MF, 50 East 42nd St., New York 17, N. Y.

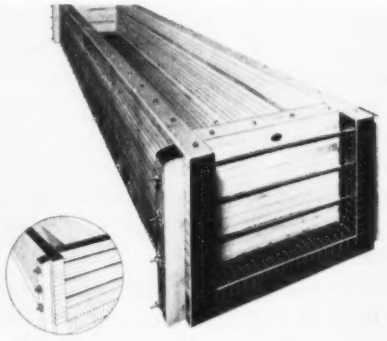
A new hot spray vinyl, specifically engineered for economical and effective corrosion control, is claimed to be particularly important to industries with chemically corrosive environments. Proven to combine ease of handling and good spraying characteristics with optimum build and appearance, the new hot spray vinyl provides 4 mils in a single spray pass. One prime and one hot spray coat give the 5 to 6 mil total thickness needed in most corrosion protection work. Vinyl thicknesses in the 10 to 15 mil range without runs or sags are possible in an uninterrupted multiple pass spray application.



The outstanding chemical resistance of vinyls has long been recognized to reduce maintenance recoating costs. Ease of handling and the high build obtainable with the hot spray vinyl mean greatly increased man-hour efficiency, because fewer coats and faster applications save time.

Laminated Wood Tanks

Wendnagel & Co., Inc., Dept. MF, 600 W. Cermak Road, Chicago, Ill.



As acid solutions have a dehydrating effect and cause excessive shrinkage in the lesser grades of large "green" timbers, and because steel mills and metal processing plants require tanks as long as sixty feet, the company pioneered a new laminated construction.

This construction allows the use of tank grade lumber three and four inches thick (the kind used in the best round tanks). Boards of this thickness can be thoroughly air dried and bolted together to form a tank of the shape usually employed for pickling. This has been found to be the solution to really tight pickling tanks. This new construction permits the building of wood tanks to almost any size required.

Organic Solvents

The Dacar Chem. Prod. Co., Dept. MF, McCartney at Wabash St., Pittsburgh 20, Pa.

A new line of degreasing solvents and cleaners has been designated as Darsol. The solvents 650, 600, and 350, are designed as replacements for carbon tetrachloride and other toxic solvents. They are adaptable for metal cleaning where rapid drying and absence of film is required. These solvents are claimed to be unusually low in toxicity compared to carbon tetrachloride and are safe to use for metal

cleaning problems. The solvents 74-C, 45-A and 62-B, are general cleaners of the emulsifying type, and can be diluted with either kerosene or water to give a low cost cleaning solution for removing grease, oil, smut, traffic dirt, on metal parts and equipment.

Exhaust Stack Cap

Hartzell Propeller Fan Co., Dept. MF, Piqua, O.

A stack cap for use in industrial exhaust systems with fan or blower located at the most convenient spot in

the system has been added to the complete line of industrial air-moving equipment manufactured by the company.

The new stack cap is a simple band of 20 gauge galvanized steel mounted on an angle iron ring which bolts to a similar ring on the end of the vent. Two galvanized lids within the windband are mounted on a brass rod which turns in plastic bearings.

The lids open automatically when the system is operating, close weathertight when the fan goes off. When the lids are open, the air stream effectively prevents the entry of rain or snow.

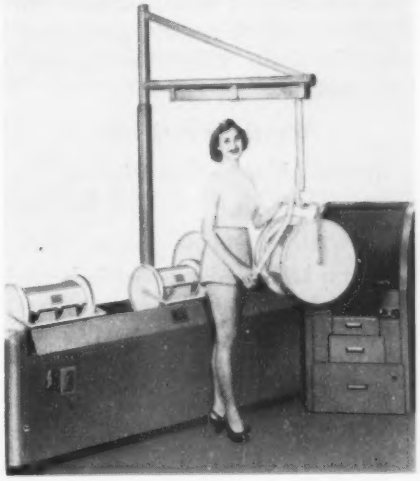
The new stack cap is available in 11 sizes, 12″ to 48″ diameters.

Tumbling Barrels

Miller Machine Tool and Gauge Co., Dept. MF, 3613 San Fernando Rd., Glendale 4, Cal.

Completely redesigned and efficiently streamlined, the new Mity-Mite line answers a long felt industrial need for high production precision barrel finishing equipment.

Five attractive, modern units mean exceptional versatility with the right unit for any industrial barrel finishing requirement. Three sizes are available for precision barrel finishing—the 36″ Double Roll "Stubby" where wall space is at a premium, the 78″ Single Roll "Long Tom" where center floor space is important and the already popular "Junior," a compact, small unit ideally suited for instrument makers, laboratories and other small parts manufacturers. Other important units include a "Hot Sawdust Unit" for waxing, polishing and drying of parts, plus an "Unloading and Separating Cabinet" to permit fatigueless barrel loading and unloading and fast parts and media separation. Boom equipment that allows operators, even female workers, to easily operate and handle barrel units with a minimum of effort and fatigue is also available as accessory equipment. All units are manufactured of prime, heavy gauge tailored steel of aircraft truss design. Cabinets are finished in restful Vista Green color with barrels in yellow and operating controls in orange as an added safety factor.



Further information may be obtained by writing to the above address.

meet a famous cost cutter!

• Well known from coast to coast, Unichrome Coating 218X is identified by the flexible, thick, pore-free and chemical resistant protection it puts on racks in one coat . . . protection that has minimized rack maintenance costs for its users.

This green plastisol compound cures into a tough coating that doesn't chip, crack, lift at contacts. blister . . . that won't contaminate sensitive baths, that withstands all plating and cleaning solutions, even vapor degreasing cycles. Its premium quality is undisputed, its adhesion outstanding.

Remember . . . as a company that has developed plating processes, given service on plating problems, pioneered in plastisol coatings, United Chromium can deliver exactly what a rack coating needs for maximum service in your plant.

UNICHROME Trade Mark

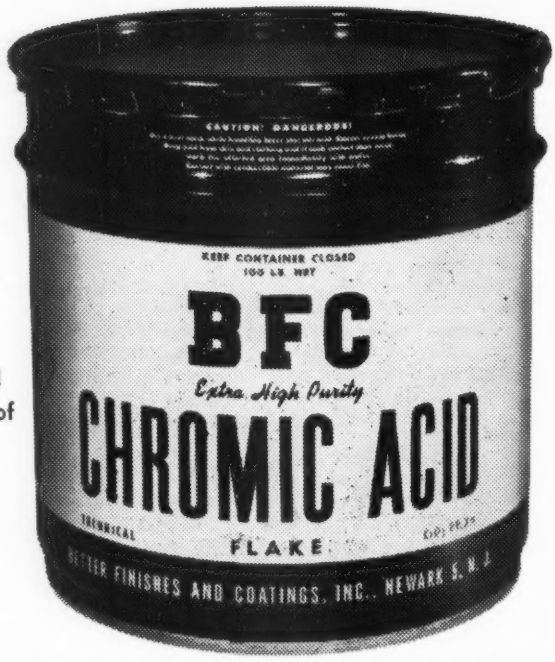
materials · processes · equipment

for better plating at less cost

UNITED CHROMIUM, INCORPORATED
A Metal & Thermit Organization

100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada: United Chromium Limited, Toronto 1, Ont.

99.75+% PURE
CHROMIC ACID
TECHNICAL GRADE—FLAKE



Ownership-management make the difference! We say exactly what we can do... and then do it without alibis or buck-passing. We think you'll like the uniform quality of BFC Chromic Acid and the single-standard-of-service behind it. When you're in the market, why not telephone us at MArket 4-6700?

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J. • 122 East 7th St., Los Angeles 14, Calif.

PAINTS · PLASTICS · CHEMICALS BFC

Manufacturers' Literature

Phosphate Conversion Coatings

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

The process by which iron phosphate coatings improve paint adherence and prevent corrosion on steel is lucidly explained and diagrammed in a new booklet.

Titled "How to Apply Iron Phosphate Coatings to Steel in Preparation for Painting," the 12-page booklet points out that the selection of iron or zinc phosphate treatments depends upon the purpose for which the article is intended. It then goes on to discuss iron phosphate coatings used in the company's process.

The booklet is well-illustrated, with diagrams, drawings, and photographs taken in plants where the process is now being used successfully.

Waste Treatment

Graver Water Conditioning Co., Dept. MF, 216 West 14th St., New York 11, N. Y.

A new bulletin discussing industrial, municipal and industrial waste treatment equipment is now available.

A concise discussion of the basic types of equipment available for treatment is included along with photographs of typical installations. The advantages of the industrial waste treatment are present, as well as the types of municipal equipment available.

A copy of this general brochure WC-117 is available from the company without obligation.

Rack Coating

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

The above manufacturer of electroplating and polishing equipment & supplies, offers a new two-color bulletin on its Grade M Kote-Rax, an improved coating for insulating and protecting racks and fixtures used in electroplating baths.

The bulletin tells how to prepare the surface of a rack or fixture before coating, how to blend and apply the primer coat and how to trim excess coating. It also gives information on how to repair accidental breaks.

Besides photographs, the bulletin includes a table that gives air-drying and baking time requirements for all applications.

Acid-Resistant Workclothes

Resistall Work Clothes, Inc., Dept. MF, 204 East 23rd St., New York 10, N. Y.

Just off the presses is a fact-filled work clothes catalog featuring a varied selection of industrial apparel made entirely of DuPont's Orlon and Union Carbide's Dynel.

The new catalog is replete with informative laboratory reports, giving factual data relative to effects of various chemicals on these materials. The technical properties of the two man-made fibers indicate distinct advantages for use under conditions of chemical exposure. The catalog is offered free of charge to everyone requesting a copy.

Electrical Control Devices

General Electric Company, General Purpose Control Dept., Dept. MF, Schenectady 5, N. Y.

A new 68-page catalog of general purpose control devices includes a special section correlating, by horsepower, components for each type of motor control application.

Designated GEC-1260A, the two-color publication contains photos, book prices, wiring diagrams, and dimensions on motor starters, con-

tactors, relays, solenoids, switches, push buttons, and pilot devices. Also included is information comparing applications and merits of manual and magnetic control, and across-the-line and reduced-voltage control.

The special section on control selection shows by enclosure, type and rating the exact components of motor control systems for each horsepower rating, including starters, push buttons, heaters, together with their order numbers and book prices. Other data covers starter modifications, auxiliary interlocks and renewal parts.

Zeolite Water Softeners

The Permutit Co., Dept. MF, 330 West 42nd St., New York 36, N. Y.

Troubles caused by the utilization of hard water and the multiple economies effected by curing them are thoroughly discussed in a comprehensive 20-page bulletin, No. 2386-A, just released by the company.

The bulletin lists several industries where steam and water are of importance and should be of interest to all engineers dealing with water problems. Specifications, operating characteristics and typical installation photographs have been included in this revised edition.

Pretreating Equipment

Metalwash Machinery Corp., Dept. MF, 923 North Ave., Elizabeth 4, N. J.

The full company line is presented in this new catalog. Sections cover machinery for washing, pickling, drying, phosphatizing, degreasing, tempering, and accessories. 66 different types of machines are illustrated. Specifications are included.

Small Parts Handling

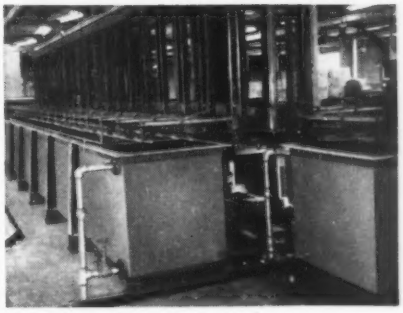
Chas. Wm. Doepke Mfg. Co., Inc., Dept. MF, 8886 Blue Ash Road, Rossmoyne, O.

A new eight-page two-color Catalog DN-1000, covers all products in the company's NesTier line of small parts handling equipment. Amply illustrated with installation photographs, the brochure also shows how an integrated, plant-wide parts handling system can be custom tailored to individual requirements using standard stocked NesTier units.

The catalog illustrates, describes and gives specifications for nesting-stacking boxes and baskets, Rollover hoppers, hopper rack assemblies and shelf racks. Used singly or in combinations, these versatile units are designed to eliminate rehandling, simplify parts control, expedite workplace supply and recover lost floor space for productive use.

HOW TO BUY RUBBER LINING

FOR LONG LASTING PROTECTION OF EQUIPMENT AND PROCESSES



For pickling and metal plating you need positive protection against corrosive effect of acids on your equipment . . . and the contamination of solutions used in your operations. Linings of thick, non-porous layers of rubber, rather than a mere film or coating, offer the kind of lasting protection that lengthens the service life of your tanks and other process equipment. Rubber tank linings should be compounded to withstand changes in temperature and present a resilient, non-breakable surface at all times.

Look for rubber linings that provide an inseparable bond of rubber to metal. Where linings are bonded to metal so securely they *can't* separate, you are assured permanent protection from corrosion and contamination as well as stray plating currents.

Entrust your equipment to the company with facilities to efficiently handle any equipment lining job, regardless of size or complexity . . . and the reputation of years of leadership in rubber lining technique . . . specify "Manhattan Rubber."

MANHATTAN RUBBER LININGS

Whether your lining problem is simple or complex, Manhattan Rubber Linings assure you lasting protection against deterioration of equipment and contamination of the solutions used in your operations. Manhattan Rubber Linings are made from thick, calendered sheets of natural or synthetic rubber . . . compounded to expand and contract with the metal without cracking and eliminate stray plating currents. Tests prove they cannot be separated from the metal without breaking. To make certain your equipment has perfect bonded protection, every Manhattan Lined Tank is tested under high voltage to detect any possible imperfections. Let an R/M lining engineer show you why Manhattan Rubber Linings are the best you can get . . . contact the R/M rubber lining facilities nearest your plant. RM 524

RUBBER LINING PLANTS AT PASSAIC, N. J.—NORTH CHARLESTON, S. C.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose
Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles
Engineered Plastic, and Sintered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

Safety Equipment

Willson Products, Inc., Dept. MF, Reading, Pa.

This new, easy-to-read, fully illustrated catalog on industrial safety equipment is designed as a workable, everyday safety manual.

The catalog is divided into four major sections—eye protection, head protection, respiratory protection, and welding. Illustrations, descriptions, and ordering information have been correlated for simplicity and practicability. All who have an interest in industrial safety will find this new catalog a reference book of great interest and value.

Furnace and Oven Controls

The Bristol Co., Dept. MF, Waterbury 20, Conn.

A new edition of the price list and specification catalog for furnace and oven control instruments and accessories contains detailed specifications and engineering data necessary for choosing the proper pyrometers and control equipment for heat-treating, metal processing or other industrial heating application. The bulletin de-

scribes and illustrates all components required in such a system, including electric control relays, motor operators and controllers, and electric and air-operated control valves. All essential accessories are also included.

Copies of the 48-page Bulletin P1260, which contains over 100 illustrations are available from the company.

Drain Troughs

Logan Clay Products Co., Dept. MF, Logan, O.

An illustrated, four-page circular describes installation features and specifications on Chemi-Drain Channel Pipe, new vitrified clay product for handling and disposal of highly-corrosive industrial wastes.

Blast Cleaning

American Wheelabrator & Equip. Corp., Dept. MF, 1179 S. Byrkit St., Mishawaka, Ind.

A new bulletin, No. 864, covers the various applications of abrasive blast cleaning to problems encountered both in the steel milling industries and in industries concerned with the processing of steel mill products. The bulletin, entitled "Eight Steps to Lower Cleaning Costs," is devoted to such things as ingot mold and slab and billet conditioning; continuous hot rolled strip, sheet, bar stock, wire rod, and steel shapes descaling; and the etching of mill rolls.

Performance data and photographs of equipment in use at particular plants are included.

Pressure Filter

Hygrade Metal Finishing Div., U. S. Hoffman Machinery Corp., Dept. MF, 105 Fourth Ave., New York 3, N. Y.

Bulletin HH 103 describes the operation of a new self-cleaning pressure filter designed to remove sludge formed by dissolving electrodes; prevent dust, dirt and oil contamination of metal parts during plating operations.

The filter is described as for use on bright nickel, acid copper, copper cyanide, zinc, zinc cyanide, cadmium, gray nickel, chrome plating with acid pickling, gold and silver cyanide, high speed copper, indium, sodium stannate, halogen tin, sulfamate lead, gold hydrate, silver strike solutions.

Preplated Metals

American Nickeloid Co., Dept. MF, Peru, Ill.

Specifications, properties and typical uses for 14 finish-to-base metal combinations of the firm's pre-plated metals are correlated on a new metals sampler-selector. In pocket-size, slide-chart form it tells at a glance the following technical data: base metal; plated surfaces; sizes of sheet, coiled strip, flat strip; gauges; tempers; properties; typical uses.

The handy guide to design and production with pre-finished metals also features eight samples with these finishes and patterns: bright chromium, satin nickel, bright copper, satin brass, 1/4" horizontal stripe, diagonal crimp, square crimp, 1/8" diamond stripe.

According to the company, the new sampler-selector is being introduced to simplify pre-design selection of preplated metals and to help the production engineer plan fabrication shortcuts and handling economies.

Electric Tachometers

Electric Tachometer Corp., Dept. MF, Philadelphia 3, Pa.

Small, rugged electric tachometers for practically any production control, speed indicating, or checking application, are fully described in a new 20-page Bulletin 540.

Included in the bulletin are ten Model M1200 magneto types with accessories for connecting magnetos to the drive source through direct coupling, pulleys, chain-and-sprockets, spur gears, or friction contact.

Over seven accurate panel indicators with scale lengths from 3½" to 17½" are described for virtually any speed-measuring application.

Chemical Pump

Vanton Pump & Equip. Corp., Dept. MF, 201 Sweetland Ave., Hillside, N. J.

A descriptive leaflet giving all the facts about the newly designed X-B pump has just been released. Design information, capacity chart, maintenance hints and application data are included. Its no stuffing box, no shaft seal construction, plus the fact that all bearings are permanently protected from fumes or chemical attack makes the X-B Pump ideally suitable for handling severe corrosive chemicals and abrasive slurries.

Motor Buying Information Catalog

General Electric Co., Dept. MF, Schenectady 5, N. Y.

Designated GEC-1026, the 28-page bulletin presents complete buying information on standard a-c fractional and integral horsepower motors in most general use. Included are general- and definite-purpose fractional horsepower motors, and f.h.p. gear motors.

A special section on the selection of integral horsepower motors covers horsepower requirements, enclosures, starting current limitations, speeds, motor types, and selection of fuses and circuit breakers. Descriptions and specifications include single-phase, polyphase, totally enclosed fan cooled, and gear-type integral horsepower motors.

Information on all motors includes photos, ratings, book prices, dimensions, weights, frame numbers, and standard modifications.

LETTER TO THE EDITOR

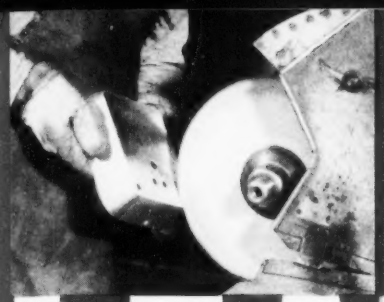
METAL FINISHING,
Finishing Publications, Inc.,
381 Broadway,
Westwood,
New Jersey, U. S. A.

Dear Sirs,

We have read with interest the article which appeared in METAL FINISHING in August 1954 entitled "Finishing in the heart of industrial Europe."

We are the sole licensees in this country for the "Rotofinish" processes for the deburring, descaling, and polishing of metal and other components, originated by the Roto-Finish Company of Kalamazoo, Michigan. We are in touch with all the leading engineering and aircraft companies and in addition to an extensive and competent sales force, we have an up-to-date demonstration and research laboratory.

We are currently building a new modern factory which we expect to occupy in a few weeks time. This will give us greater capacity and we are interested in marketing an additional



LEA Compound

LEA Learok

LEA Liquabrade

THE FIGHTIN'EST TEAM IN THE FINISHING FIELD

Like Athos, Porthos and Aramis of Dumas' imagination, these three Lea Musketeers for years have fought the battle for economical and quality surface finishing. They've taken on all comers. Whether for the final finish or intermediate preparation for plating, one or more of these compounds can be found in most plants where low overall finishing costs combined with quality finishing are the objectives.

- **LEA COMPOUND** is industry's pioneering *greaseless* composition. Introduced in the 20's, it's the leader today and is available in many kinds and sizes of abrasive grains. It's the ideal composition for producing satin finishes or for flexible polishing and burring on stainless as well as silver, brass, aluminum and other non-ferrous products.

- **LEAROK** complements LEA Compound. It's industry's pioneering and today's leading "no-free-grease" composition. With no tendency to pack, therefore clean, it long ago proved a boon to plants finishing articles with crevices and contours.

- **LEA LIQUABRADE** . . . a post-war development by the Lea Technical Staff, is fast establishing its superiority and preference in many plants, particularly where production line automatic methods of finishing are set up. Stable, non-settling, completely non-flammable and non-explosive, it is being bought by many large companies in trailer lots. Like the other Lea compositions, LIQUABRADE comes in a wide variety of types and sizes of abrasive grains.

While this particular message is on these three outstanding Lea Finishing Compositions, don't forget Lea Technical Service. We're at your service in connection with *any* surface finishing problem you may have. We have complete laboratory facilities to do any necessary test work. We can help correct wrong methods now being used and help start you out right on new products.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions.

Manufacturers of Lea Compound and Learock . . . Industry's quality buffing and polishing compounds for over 30 years.

LEA®

THE LEA MANUFACTURING CO.
16 CHERRY AVE., WATERBURY 20, CONN.

Lea-Michigan, Inc., 14488 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 370 Victoria St., Toronto 2, Canada
Lea-Ronal, Inc., Main Offices and Laboratory: 42-47 27th St., L.I.C. 1, N.Y.
Manufacturing Plants: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in Plating Specialties? **SEE THE OTHER SIDE OF THIS INSERT.**

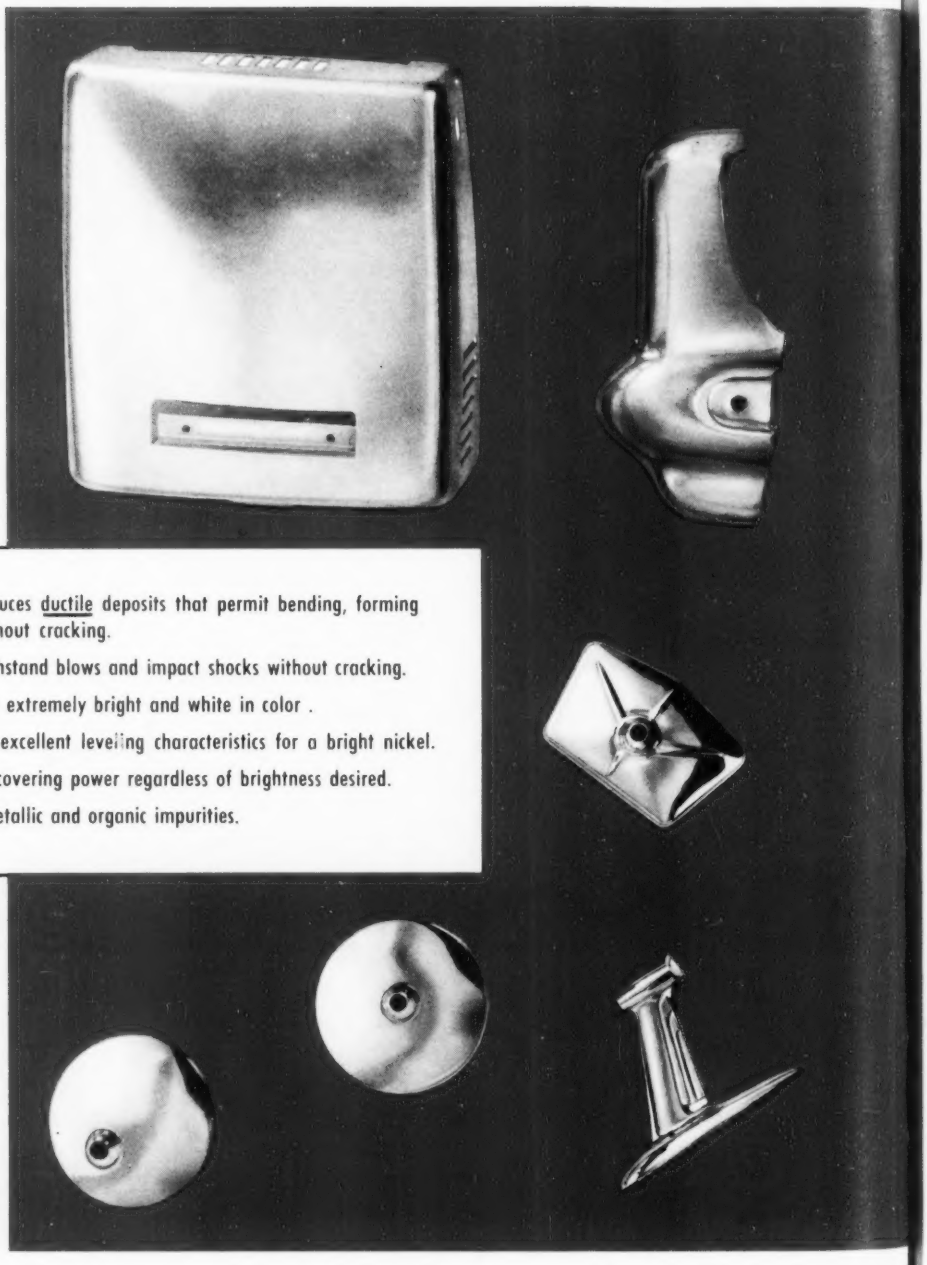
ANNOUNCING!

Lea-Ronal

Bright Nickel Process

You Get { Extremely Ductile Deposits
Brilliance
Leveling

Would such a nickel plating process meet your objectives better than the processes and solutions you are now using?



Here are some of the Lea-Ronal Bright Nickel advantages:

- Lea-Ronal Bright Nickel produces ductile deposits that permit bending, forming operations, and welding without cracking.
- . . . ductile deposits that withstand blows and impact shocks without cracking.
- . . . ductile deposits that are extremely bright and white in color .
- Lea-Ronal Bright Nickel has excellent leveling characteristics for a bright nickel.
- . . . has high throwing and covering power regardless of brightness desired.
- . . . has high tolerance to metallic and organic impurities.

You can easily convert your present nickel plating methods to the Lea-Ronal Bright Nickel Process, using Lea-Ronal Nickel Gleam Addition Agents as brighteners. Our process serves equally well for either still tank or barrel plating.

Place a trial order for Lea-Ronal now. Make a competitive test with one tank or barrel now being used in your present production schedule. Then note the difference in results . . . and costs!

PRODUCTS OF RESEARCH — Chemistry, Metallurgy, Electroplating — DEVELOPERS OF ELECTROCHEMICAL PROCESSES

Lea-Ronal *Inc.*

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The
LEA GROUP
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Plating Polishing Buffing Burring

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product or process in an allied field to our preesnt one and which we can exploit under our existing organization. If you receive any inquiries from American companies operating in fields allied to our own who want to operate in Europe and the British Commonwealth, either by license or other arrangement, we should be very grateful if you would be kind enough to put us in touch with them.

Yours faithfully,

for ROTO-FINISH LIMITED,
B. Hills

NEW BOOKS

Small-Scale Inorganic Qualitative Analysis

By J. T. Stock & P. Heath. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 1954. Price: $2.50. 96 pages.

Although prepared as a textbook, the practicing chemist will find this treatment of the subject to be a very practical addition to his library. The technique described is simple and direct, avoiding the lengthy trials of older methods, and the procedures have been made as general as possible, with considerable stress placed on preliminary tests and treatment of insoluble unknowns. The book doesn't have much bulk but all the contents are meat and it can be highly recommended, especially for those chemists who have not had much opportunity to perform a complete qualitative analysis since they left school and, as a result, require step-by-step directions.

Rapid Detection of Cations

By G. Charlot, D. Bezier & R. Gauguin. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 1954. Price: $3.00. 92 pages.

This first English translation by *R. E. Oesper* of a successful French textbook describes very efficient specific qualitative methods for determination of metals and alloys in the presence of large amounts of other metals. Separations have been kept to a minimum but, where they are necessary, they have been made as quantitative as possible. A valuable inclusion is the determination of the presence or absence of whole groups of elements by specific reactions, a very effective time saver for the analyst.

Tests of Electrolytic Tinplates for Canned Foods

E. G. Davis: *Australian Journ. Applied Science.* Vol. 5, No. 2, pp. 196-210.

Details are given of tests which were conducted of electrolytic tinplate in cans for Australian canned foods. The report embodies the results of investigations which were made with four different preserve packs. The packs were of English and American origin, and were observed at 100°F. for 15-16 months, and then tested for vacuum, water absorption, iron and tin content. The cans investigated were fabricated from electrotinned and hot dip tinned sheet and finished on the inside with a lacquer coating. The lacquers tested originated in America, England and Australia.

The test results showed that Australian fruits and vegetables can be very well packed, if the cans have a coating of 1.50 lb./base box hot dipped tin or 0.50 lb./base box, lacquered electrotinned coating.

Detailed figures of the test results are given in the form of tables. The machines and apparatus used for the testing are described and diagrams of these are given. It is considered that this report can serve as a guidance for other research in this direction.

Electropolishing of Stainless Steel Table Knife Blades with Phosphoric-Sulfuric Acid Mixture

H. Stuedemann and W. Then: Research Report No. 65 (1954) of the Research Institute of the *Fachschule fuer Metallgestaltung und Metalltechnik*, Solingen, Germany.

As it was found that the electropolishing of knife blades in perchloric acid did not result in a satisfactory final polish, the polishing characteristics of bath mixtures containing no perchloric acid were investigated. With the electropolishing treatment, the roughness of the surface of stropped blades should be so far reduced that they could be subsequently finish polished mechanically. This process should actually not be designated as anodic polishing but must be regarded as an electrolytic processing treatment.

During the course of these investigations the best results were obtained with the following electropolishing bath mixture:

Phosphoric acid	700 cc.
Sulfuric acid	300 "
Water	50 g.
Chromic acid	50 "
Ferrous sulfate	20 "
Ferric hydroxide	100 "

The most favorable polishing conditions were found to lie between 30 and 140 amp./sq. dm. with a bath temperature between 80 and 90°C. The brightening effect was, however, lower than with the use of a perchloric acid bath.

With the use of current densities of about 130 amp./sq. dm. (current efficiency about 38%) it was found possible to smooth down the surface roughness of stropped blades (maximum 5 microns) inside of 5 minutes (down to about 0.3 microns). Nevertheless, the surfaces still showed a certain waviness with depths up to about 1 micron. The smoothing rate was found to be 10 times as great as with a perchloric acid bath, but the obtainable end-smoothness is considerably inferior. No satisfactory results were obtained in the test to finish polish mechanically the blades so treated, presumably because of the waviness of the surface.

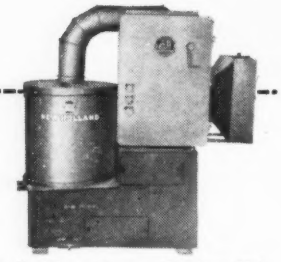
Finishing Handbook & Directory

Edited by I. S. Hallows. Published by Sawell Publiations Ltd., 4 Ludgate Circus, London, E. C. 4, England. 1955 edition. 485 pages, including index.

As usual, the directory section of this book, which is available to subscribers of the British magazine *Product Finishing*, is an important part but of interest mainly to British finishers. This directory section has been completely revised into classifications which correspond with the sections in the handbook for easier reference. Several sections have been added to the fifth edition, including types of paint, paint application methods, selection of painting schemes and finishes for aluminum, plus a glossary of finishing terms. As a matter of fact, organic finishing processes are treated in much more detail than metal treatments and finishes.

Why it pays to SPIN-DRY plated work—small lacquered parts

Choose from 3 carefully engineered models . . .



1. Standard Model. Takes nearly every type of part. Built for long, trouble-free service. J. I. C. and N. E. C. controls also available.

Saves time . . . With the New Holland Kreider Dryer operating at 625 r.p.m. on only ¾ h.p. you can *spin-dry* a basket of parts (1140 cu. ins.) in as little as 35 seconds—no more than 2 minutes.

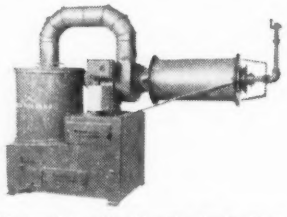
Improves quality. . . With a New Holland Kreider Dryer, high speed centrifugal spin-drying eliminates scarring and marring, assures smooth, evenly dried surfaces, with longer lasting luster . . . fewer "rejects."

Cuts costs . . . What's more, though a New Holland Kreider Dryer occupies less than 6 sq. ft. of floor space, it's a big money saver. Power costs are low, production high—with little or no maintenance over the years. And one man can operate it, easily, efficiently.

See for yourself. Write Department MF-5-500 today for illustrated 4-page folder.

New Holland Machine Co., New Holland, Pa.

2. With Auxiliary Steam Heating Unit. Used for small parts that hold moisture—lacquered parts—or where cold water rinse is used. Shown with J.I.C. control—N.E.C. control also available.



3. With Auxiliary Gas Heating Unit. Used for small parts. Caution: Do not use with inflammable materials.

NEW HOLLAND KREIDER DRYER

Robert E. Moore

ing from the Newark College of Engineering, and his M.S. in Metallurgy from Rensselaer Polytechnic Institute. While at R.P.I., he spent two years in research on theory and mechanism of chromium and chromium alloy plating. He is also well versed in barrel finishing methods, plating, cleaning, pickling and other aspects of metal finishing."

Frank Marshall Joins Belke

Belke Manufacturing Co. announces that *Frank Marshall* has joined the company's sales organization and will cover Wisconsin and Northern Peninsula of Michigan.

Mr. Marshall has an extensive background in metal fabrication and finishing.

Graver Announces a New Sales Representative

H. T. Sulcer, vice-president & general manager of *Graver Water Conditioning Co.*, New York, has announced the appointment of the *Frontier Engineering Services Co.* of Salt Lake City, Utah as new representatives. Their territory consists of the northern and western parts of Wyoming, most of Nevada and all of Utah.

This organization which can be reached through P.O. Box No. 1772, Salt Lake City, will handle Graver's complete line of industrial, municipal and industrial waste treatment equipment.

W. R. Olsen and *W. R. Fresne* of Frontier are both well versed in power plant and water conditioning work and will be an important addition to the company's increasing sales organization.

BUSINESS ITEMS

Mutual Chemical Adds to Baltimore Property

Mutual Chemical Division, Allied Chemical & Dye Corp. has purchased an additional four acres adjoining its present Baltimore works, it was announced by *George A. Benington*, president.

The new property was acquired from F. Bowie Smith, a well known Baltimore lumber operator. According to Mr. Benington, this addition will be important to the future development of Mutual's manufacturing, storage and shipping facilities at Baltimore.

Moore Appointed by Frederick Gumm Chemical Company Inc.

The *Frederick Gumm Chem. Co.*, of Kearny, N. J., manufacturers of Clepo compounds, announces the appointment of *Robert E. Moore*, as their Eastern New York State representative, with headquarters in Syracuse. Mr. Moore is very well equipped to service his products, having spent the past three years in the Company's laboratories. He also spent two years in job plating shops, and one year in electroforming.

Mr. Moore received his Bachelor of Science degree in Chemical Engineer-

Rampe Manufacturing Company Moves to Larger Factory

The demand for increased space forced the *Rampe Mfg. Co.* to open a second factory three years ago. It has now led to a consolidation of both plants in a factory with double the combined floor space of the two old plants. The new factory is located at 14915 Woodworth Ave., Cleveland 10, Ohio. The company manufactures an economy priced line of tumbling and burring machines which will be further increase by new models within the next few months.

Cowles Organizes New Department for Market Development

A new Department Of Market Development will start immediately to strengthen marketing activities of *Cowles Chemical Co.*, Cleveland, Ohio. Plans for its organization were announced recently by *C. C. Bassett*, vice-president and director of sales for the manufacturers of industrial alkalies and detergent materials.

Robert V. Finch will head up the new department as manager market development. His responsibilities will include sales correspondence, promotion, advertising, sales research, market studies and related activities.

Previously, many of these staff functions were performed separately by the firm's laundry, metal cleaner, food sanitation, and heavy chemical departments. They are now being coordinated for greater efficiency and effectiveness, and to free the department managers and sales managers for greater emphasis on sales supervision and training.

Robert V. Finch

Just what you want—
FAST DEPOSITS
UNIFORM DEPOSITS
HUSSEY
Plating Quality
COPPER
ANODES
Genuine plating quality anodes manufactured to exacting specifications to assure fast, uniform deposit. Immediate delivery.
C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
ROLLING MILLS AND GENERAL OFFICES, PITTSBURGH 19, PA.
7 Convenient Warehouses to serve you promptly!
PITTSBURGH . 2850 Second Ave. CHICAGO . . . . 3900 N. Elston Ave.
CLEVELAND . . 5318 St. Clair Ave. ST. LOUIS . . . . 1620 Delmar Blvd.
NEW YORK . . . . . 140 Sixth Ave. PHILADELPHIA. 1632 Fairmount Ave.
CINCINNATI . . . . 424 Commercial Sq.

Finch has been with the company for nearly 18 years—serving at various times in most of their sales and technical departments. His experience includes chemical research, product development, technical sales service, direct sales, correspondence, promotion, advertising, sales research, and sales training.

Most recently, he has served as manager of the laundry laboratory. He will continue as technical advisor to their laundry sales department and as editor of Cowles Laundry Tips.

H-VW-M Appointments

Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturer of electroplating and polishing equipment and supplies, announces the appointment of *Glenn M. Herring* as manager of steel mill sales.

The company also announces the concurrent appointments of *William H. Brown* as sales representative at Philadelphia for eastern Pennsylvania, and *Frank W. Mountain* as sales representative at Pittsburgh for western Pennsylvania, West Virginia and Alabama.

Herring has been associated with major steel mills and steel mill suppliers for 25 years, serving as an H-VW-M representative in the Pittsburgh area. He now moves to the company's home office in Matawan.

A specialist in continuous cleaning and plating operations, Herring has

COPPER-TIN
BRONZE PLATING
A NEW Decorative Finish
A tin-bearing bronze for beautiful new, bright, decorative finishes of proven sales appeal when used for handbag frames, light fixtures, hardware, costume jewelry, etc.
Simplifies and Speeds PRODUCTION
M&T bronze can be controlled as readily as single metallic salt baths—has excellent throwing power plus a wide bright plate range that minimizes burning and missing . . . plating speed is up to 50% faster than with other bright baths. Make-up and replenishment costs are low.
Proven ECONOMICAL
A well-known metal finishing company had this experience:
They previously plated with a brass bath for over 35 min., and performed 2 costly buffing operations. When they switched to M&T bright plate, they cut plating time to just 8 min., eliminated buffing entirely!
For further information, write:
METAL & THERMIT CORPORATION
Chemical Division
100 EAST 42nd Street · NEW YORK 17, NEW YORK

Frank W. Mountain

also had extensive experience in the motor-generator and rectifier field.

A graduate of Lafayette College, Herring joined the company in 1930 as a salesman. His first assignment was in the Pittsburgh area, and he has served there since, with time out for military service. During World War II, he was a major in the U. S. Air Force.

Mountain takes over Herring's territory. He moves from the Philadelphia office, where he was covering the territory of eastern Pennsylvania. A graduate of Colgate University, class of 1950, Mountain is a company-trained sales representative, having worked for a year in the laboratory before going into the field.

Brown takes over Mountain's territory in eastern Pennsylvania. He moves to the Philadelphia office from Matawan where he was working as a sales engineer. Following World War II, Brown was associated with the Beydel Chemical Co. as a technical sales repreesntative, and research and development engineer. He subsequently worked as a safety director with the Signal Corps Engineering Laboratory at Fort Monmouth, N. J.

A veteran of World War II, Brown attended Columbia University where he studied chemical engineering, and Rutgers where he undertook courses in sanitary engineering. He is a member of the American Electroplaters' Society.

Glenn M. Herring

William H. Brown

Kilb Appointed by Hammond

Donald A. Kilb has been appointed district representative for *Hammond Machinery Builders, Inc.*, Kalamazoo, Mich. Mr. Kilb will have headquarters

Donald A. Kilb

in Cleveland. He will represent the company for their line of abrasive belt grinders, polishing and buffing lathes and dust collectors.

U. S. Hoffman Machinery Corp. Appoints Elliott

U. S. Hoffman Machinery Corp., New York, has announced the appointment of *Edward H. Elliott* as representative for its *Hygrade Metal Finishing Division* in the Philadelphia area.

Elliott, 1620 Murdoch Road, Philadelphia, will serve a territory which will include eastern Pennsylvania, the State of Delaware, and the southern area of New Jersey, according to *Revis L. Stephenson*, vice-president.

Elliott has been connected with the engineering of industrial equipment for a number of years. A graduate of the University of Delaware, he holds a bachelor of science degree in mechanical engineering. He is a veteran of the U. S. Navy.

He is a member of the American Society of Mechanical Engineers and the Engineers' Club of Philadelphia.

Udylite Holds Sales Meeting

The Udylite Corp. concluded its 3-day National Sales Meeting with a banquet at which service awards were presented to 17 men employees by *Clyde H. Reeme*, president.

Ten men received 15 year bronze lapel buttons. Six men received 20 year buttons and gold watches.

L. K. Lindahl, chairman of the board of directors, received a gold lapel button commemorating his 30 years of service.

These presentations raised the Udylite Service Club membership to a

ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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To help solve your precious metal plating problems....

For efficient, trouble-free plating results, *consistently*, you can safely depend upon APW anodes and precious metal salts for your plating production.

You'll appreciate APW service, too—deliveries are prompt, the valuable experience and facilities of our Electroplating Research Division are available to you—to help minimize your costs or improve efficiency in your plating procedures.

There's no charge or obligation for APW technical service. We just want to be sure you know it's yours for the asking and that you use it—*freely!*

A partial list of APW plating products:
A. A. SILVER ANODES
POTASSIUM SILVER CYANIDE
SILVER CYANIDE
C. P. SILVER NITRATE
Meets A.C.S. Specifications

Write for information and current quotations

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231 New Jersey Railroad Avenue • Newark 5, N.J.

APW

total of 51, all of whom have served the company 15 years or more.

The total service represented by the Club members is 935 years.

Dr. Hyman Chessin Appointed by Van der Horst

John Poor, director of research and development for the *Van der Horst Corp.*, Olean, N. Y., announces the appointment of *Dr. Hyman Chessin* as assistant director of research and development.

Dr. Chessin received his doctorate in physical and electrochemistry at Western Reserve University in Cleveland. Prior to joining the company, he taught at Kenyon College and conducted research at the University of Arkansas.

Dr. Hyman Chessin

In his new position, Dr. Chessin will assist in research for product improvement and development, in addition to conducting research into broader applications for the corporation's Porus-Krome and Vanderloy electroplating processes.

Henry Kraus Joins Davies Supply

Henry Kraus

Henry Kraus has been added to the engineering staff at *Davies Supply and Mfg. Co.*, St. Louis, it was announced by company president *L. A. Davies*.

Kraus graduated from Washington University (St. Louis) with a B. S. in Chemical Engineering. He comes to the company from Emerson Electric where he spent six years as a materials and methods engineer concerned with electroplating. Mr. Kraus will concentrate chiefly on job estimating and cost analysis.

Gordon Kiddoo Elected Vice-President-Development

The election of *Gordon Kiddoo* as vice-president-development of *National Research Corp.*, Cambridge, Massachusetts, was announced by *Richard S. Morse*, president.

Associated with the company for the past four years, Mr. Kiddoo has been director of the development department for the past three years. He is a chemical engineering graduate of Cornell University, and was previously associated with Hydrocarbon Research Inc., The Texas Company, and Continental Carbon Co.

Deming Company Appoints Anderson

The Deming Company, Salem, Ohio, manufacturer of commercial and in-

dustrial pumps and water systems, has appointed *Dexter F. Anderson* as district representative in the Far Western states. He will cover ten states west of the Rockies.

Anderson is a graduate of Beloit College. He was previously associated with Mott Brothers, Deming distributors in Rockford, Illinois. Anderson

Dexter F. Anderson

handled pump and mill supply sales for the Mott firm.

Anderson will call on distributors and dealers in the Far West and also works on specific pump applications for industry.

25th Exposition of Chemical Industries Announced

Announcement has been made that the *25th Exposition of Chemical Industries* will be held at the Commercial Museum and Convention Hall, Philadelphia, December 5 to 9, under the management of the International Exposition Co., 480 Lexington Avenue, New York 17, N. Y., *E. K. Stevens*, manager. As heretofore, the exposition will cover the many aspects of chemistry and chemical engineering that are applied throughout the industrial world, including achievements accomplished since the last exposition was held, two years ago. More than three hundred applications for space had been received up to the time of the published announcement.

Gilbert Tramer Appoints Grohs

Gilbert Tramer, president of *The Gilbert Tramer Co.*, Cleveland, Ohio, announces the appointment of *Edward M. Grohs* as assistant sales manager. Mr. Grohs has had many years of sales, service and purchasing experience with various companies. He was

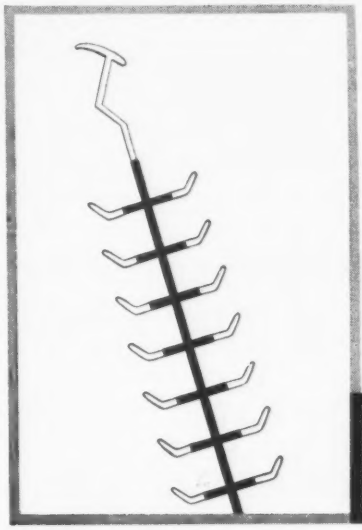
4 is a better "Point" than 7

when you're playing with

RACK COATINGS

It just isn't natural to make a point of dipping a rack seven times to get a coating thickness of 20 mils — when you can do it with four!

New Tygon Air-Dry Rack Coating 277 builds a film thickness of five mils per dip. This new "higher-solids-content" coating cuts rack maintenance costs way down — saves by cutting rack handling time almost in half — saves by cutting "down-time" for rack recoating — saves by increasing plating cycles per rack.



PLACE A TRIAL ORDER TODAY

See for yourself why electroplaters who have tried Tygon 277, say — "the finest rack coating we've ever used." 275-D

U. S. STONEWARE CO.
AKRON 9, OHIO
PLASTICS AND SYNTHETICS DIV.

Edward M. Grohs

graduated from Western Reserve University in 1926, LL.B. 1928. During four years of World War II he served as Major in the U. S. Army.

Udylite Elects New Directors

Two new directors of the *Udylite Corp.* have been announced by *Leon K. Lindahl*, chairman of the board.

One of these new directors is the *Hon. George Edward Bushnell*, Sovereign Grand Commander of the Northern Masonic Jurisdiction of Scottish Rite Masons. Previously Judge Bushnell was Chief Justice of the Supreme Court of Michigan, having been first elected a Justice of that Court in 1933. He brings to the board of directors wide business experience gained in the

practice of law, having been admitted to the Bar in the State of Virginia as well as the State of Michigan. He served as an officer in the United States Army in the First World War, commissioned as a Captain. Judge Bushnell has received honorary degrees from Wayne University and the University of Michigan.

Also elected to the Board is *George F. Breen*, of New York City, a financial counsel who has devoted his business life to corporate finance and is widely known for his advice in that field.

Stanley Sax Named Director of American Buff Co. Research Division

American Buff Co., Chicago, announces the appointment of *Stanley P. Sax*, as director of research in charge of process and product development.

In his new capacity, he will direct compilation of all data and performance reports on company products. This information will be catalogued to permit rapid, documented reference for every type of buffing and polishing problem, thus completely eliminating guesswork.

Stanley P. Sax

A complete, new laboratory has already begun to conduct exhaustive tests to determine the physical characteristics of various metals and the types of buffs most suitable for each. All buffing problems will now be referred directly to the research division.

Mr. Sax was graduated with high honors from the University of Wisconsin as a Phi Betta Kappa and stayed on after graduation as an instructor of psychology for one year, before joining the company. He served for 3 years in the Pacific area during World War II and is now a captain in the Army Reserve.

He will continue to direct sales operations in the Detroit area where he has been located during the past several years.

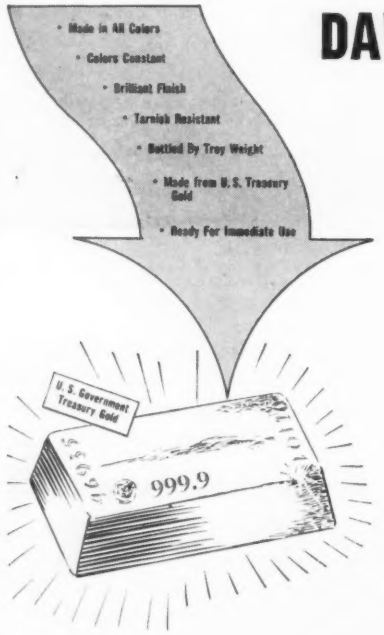
New Sarco Sales Agent in North and South Carolina

H. L. Simmons, president of *Sarco Co., Inc.* announced that on March 14th, *Hoffman & Hoffman Co.* succeeded the *Royster H. Johnson Co.* as their sales representative in North and South Carolina.

The new sales representative has sales offices in Greensboro, N. C., Raleigh, N. C. and Columbia, S. C.

Sunshine Scientific Instrument Adds to Line

Sunshine Scientific Instrument, 1810 Grant Ave., Philadelphia 15, Pa., announces the outright purchase of all the stock, parts, drawings, engineering, tools, jigs, fixtures, patent rights, etc., to eighteen instruments which were newly designed and developed by the


• Made in All Colors
• Colors Constant
• Brilliant Finish
• Tarnish Resistant
• Bottled By Troy Weight
• Made from U.S. Treasury Gold
• Ready For Immediate Use
U. S. Government Treasury Gold
999.9

DAVIS-K GOLD PLATING SOLUTIONS

•

67% POTASSIUM GOLD CYANIDE SALTS

•

LUSTROUS WHITE RHODIUM SOLUTION

THE ONE OUTSTANDING DEVELOPMENT IN GOLD PLATING DURING THE PAST QUARTER CENTURY

DAVIS-K

ONE OPERATION

Antique Gold Solution

TANK RHEOSTATS: We are pleased to announce our variable type tank rheostats which are specially designed for precious metal plating.

DAVIS-K SERVICE: Our service today with its newly expanded facilities is fast and efficient. We are fully equipped to reclaim your old gold and rhodium solutions. Phone or write your precious metal problems. We welcome them!

"Where Glittering Elegance Reflects Lasting Quality."

DAVIS-K PRODUCTS CO.

135 West 29th St. LOngacre 4-1978 - 9 New York 1, N. Y.

Special Products Division of *The General Electric Co.*

The instruments, including the anodized aluminum tester, will be manufactured, sold and serviced exclusively by Sunshine according to General Electric drawings and specifications. All instruments originally purchased through General Electic can now be serviced by Sunshine. Those units which are still under warranty, or any units requiring supplies, accessories or replacement parts, will be handled by Sunshine Scientific.

Beckman, Inc., Announces New Custom Products Department

An important new unit was added to *Arnold O. Beckman, Inc.* operations recently with the formation of a Custom Products Department headed by *Robert W. Negus.*

Over recent years, there has appeared a growing demand for instruments and auxiliary equipment for specialized applications. Because of this demand, the Custom Products Department was created to handle work of this nature.

Robert W. Negus

The major purpose of the new department is twofold:

1) To modify standard company instruments and equipment to meet the needs of specialized applications.

2) To engineer and construct instruments to order which use magnetic susceptibility, thermal conductivity, differential electrical conductivity, or other principles of operation on which the company has completed basic research or development.

By establishing separate administrative and manufacturing facilities for the new department, the company can give full and prompt attention to the special requirements of customers. Also, operation of the department as a separate function will allow it to progress side by side with the manufacturing facilities of the plant which produces the regular line of instruments.

Copper Pigment and Chemical Works Completing New Plant

A new, large-capacity chemical plant for the production of nickel sulphate has attained the final stages of installation at the *Copper Pigment and Chemical Works* in Elizabeth, N. J. The new plant will establish the company as a consistent primary supplier of the vital plating chemical.

The new, competitive position of nickel sulphate will undoubtedly be of great advantage to the electroplating industry, which employs large quantities of the material in the secondary nickel undercoating of chrom-

Schorithene
FLAME-SPRAYED
Corrosion-Resistant Polyethylene-Lined Drums
Better — Yet Cost Less

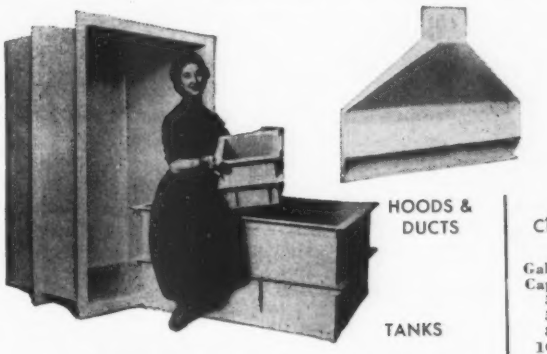
Seamless Standard

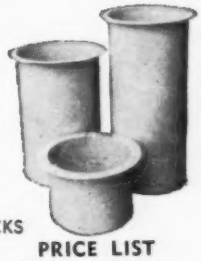
PRICE LIST

Gallon Cap.	Inside Diam.	Inside Height	List Cost
	STANDARD		
20	18″	20″	24.50
30	18″	27″	29.50
55	22″	34″	36.50
	SEAMLESS		
30	18″	27″	40.00
50	22″	34″	52.00

Covers $4.00 extra

IOLYTE LAMINATED FIBERGLAS **TANKS, DUCTS, CROCKS**





Fabricated to Your Specifications

- **NO MOLDS NEEDED** — Made any size, any shape, at no extra cost and no loss of delivery time.
- **UNIFORM DIMENSIONS — NO TAPERING** — Dimensions are same at bottom and top . . . means larger capacities than tapered molded tanks.
- **FLANGES, DAMS, Etc.** — Can be inexpensively equipped with flanged connections, holes, overflow dams, baffles, separations, etc.
- **CHEMICALLY RESISTANT THROUGHOUT** — Fabricated from IOLYTE sheet properly reinforced. This is a structural material . . . not a lining.

Write for literature, prices, and table of chemical resistance for Iolyte.

PRICE LIST

Gal. Cap.	Outs. Diam.	Outs. Hght.	List Cost
5	9″	18″	18.00
5	10″	15″	18.00
8	12″	16″	22.00
10	12″	20″	24.00
12	12″	24″	26.00
9	10″	24″	23.00
7	9″	24″	21.00
10	16″	12″	26.00
12	16″	14″	28.00
15	16″	18″	33.00
20	16″	24″	40.00
30	16″	36″	49.00
40	16″	48″	59.00
14	18″	12″	35.00
20	18″	18″	40.00
26	18″	24″	45.00
30	18″	28″	49.00
40	18″	36″	59.00
50	18″	48″	69.00
27	22″	18″	49.00
30	22″	20″	53.00
55	22″	36″	70.00
73	22″	48″	83.00
55	28″	22″	76.00
95	28″	36″	98.00
125	28″	48″	125.00

Order from us or your distributor. Unless rated firm, payment with order. No COD's.

ALL PRICES F.O.B., L. I. C.

DISTRIBUTOR TERRITORIES OPEN

SCHORI PROCESS DIV. OF FERRO-CO CORP. 8-11 43rd Road, L. I. C. 1, N. Y.

Factory 59-31 54th St., Maspeth, L. I.

ium-plated hardware and fixtures.

The processing techniques employed in the new plant permit precise quality control and assure the production of high-purity nickel sulphate with excellent plating characteristics.

Upon completion of final preparations for production, the company will become a major supplier of chromium underplating materials, supplementing its present large-scale production of high-grade copper cyanide with the new primary product.

Blount Addresses Plating Class

Ezra A. Blount, editor of *Products Finishing* appeared as guest-lecturer before the joint classes in electroplating at the Brooklyn Evening Technical High School on Tuesday evening, March 8, 1955. In his talk, Mr. Blount traced the development and growth of the electroplating industry from the period of important contributions to science by such men as Volta, Ampere, Mendelejeff, Coulomb and Faraday to the current procedures where refinements in plating processes permit laboratory operations with current densities as high as 6000 a.s.f. And now automation is coming to the fore with complete plating cycles performed by electronic control with an additional control box, a supplementary feature, serving as a trouble shooter for the electronic control, by indicating precisely what is wrong and where.

The significant phase of these developments, Mr. Blount stressed, is industry's need for men with adequate technical backgrounds for the efficient operation and control of such processes. In that respect, Mr. Blount found a striking renascent spirit, in areas where the industry is concentrated in the return to classroom study as an effective means of meeting this situation.

The members of the class indicated their appreciation of this fine presentation by an extended question-answer period and a vote of thanks.

Stokes Opens New Sales Offices

F. J. Stokes Machine Co., Philadelphia, Pa., has opened a new New York district sales office at 26 East 1st St., Mount Vernon, *J. C. Coleman*, district manager, has announced.

At the same time, Mr. Coleman announced the opening of a branch office at 2165 Morris Ave., Union, N. J., to serve the new concentration of industrial firms in Northern New Jersey. *Ralph H. Stalbaum*, who has been serving this territory from the New York office, will be in charge of the new Union office.

Mr. Stalbaum was graduated from the University of Nebraska in 1940 with a B.S. in Chemical Engineering. Before joining the Stokes sales staff, he had been a development engineer with Sinclair Refining Co. in East

BEAM-KNODEL CO.

Metropolitan Distributors

HANSON-VAN WINKLE-MUNNING CO.

Complete Service for Metal Finishing

Products Listed Below Available in New York Stock With Reasonable Exceptions

GENERATORS

Anodes, All Kinds	Tallow	Nickel Salts
Brushes	Rouge	Copper Salts
Buffs	Emery Paste	Cyanide
Chemicals	Cleaners	Tanks, All Kinds
Tripoli Comp.	Emery	Plating Barrels
Acme White Finish	Glue	Polishing Wheels
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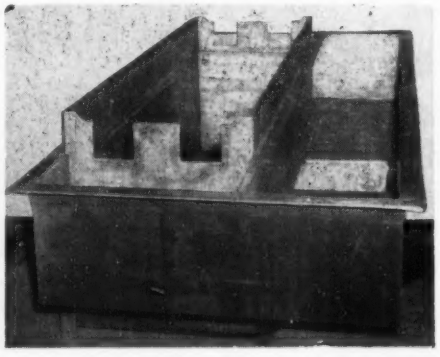
195 LAFAYETTE ST., COR. BROOME

Phone CAnal 6-3956-7 NEW YORK 12, N. Y.

FILTERS

MAIZO Drying Materials

LEA Buffing & Polishing PRODUCTS



Lead linings that outlast your expectations

STORTSWELDED lead linings stand up to their jobs longer because the materials in them are expertly selected, and because extra multiple-pass welding is used at every joint.

Storts also furnishes solid lead tanks, coils, anodes and all varieties of fittings and assemblies of lead.

STORTS WELDING COMPANY INCORPORATED

38 Stone Street MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

Chicago, Ind.; New England district manager for the Duriron Co., Dayton, Ohio; and district manager in Pittsburgh, Pa., for the Byron Jackson Co., Los Angeles.

It was also announced that *William J. Leighton* has joined the Philadelphia district sales office as a sales engineer.

A long-time resident of Philadelphia, Mr. Leighton was graduated from Villanova University in 1950 with a B.S. in Mechanical Engineering, and immediately joined the sales staff of Conoflow Corp., Philadelphia instrument and valve manufacturer. Previous to entering Villanova had had served two and a half years with the U. S. Army.

Mixer Advanced by MW Protective Coatings

Richard A. Mixer, corrosion engineer in the *MW Protective Coatings Div.* of *Metalweld, Inc.* was recently advanced to the position of manager of that division.

Before coming to the company, Mr. Mixer was associated with the plastics division of a large Philadelphia chemical firm.

Richard A. Mixer

He attended the University of Michigan where he received his BS in Chemical Engineering and his master's degree in Business Administration. He is also a member of the National Association of Corrosion Engineers.

Barber-Colman Adds to Wheelco Division

R. A. Schoenfeld, sales manager of the *Wheelco Instruments Div., Barber-Colman Co.*, announces several recent additions to the firm's field organization.

The sales and service facilities of the Philadelphia office have been expanded with the addition of new personnel. *H. V. King*, formerly of the Chicago office, is now with the Philadelphia office. *Harold Sieber*, of Philadelphia, has joined the service organization.

Mr. Schoenfeld also announced that *D. Combellack*, formerly associated with the Detroit office, is now located at the Atlanta, Ga., office. *Henry Hoffman*, who was recently with the Cleveland office, has been given the responsibility of managing the new Columbus, Ohio, sub-branch office.

Wilkerson Appointed by Diamond Alkali

Appointment of *Martin F. Wilkerson* as manager of the Houston, Tex. branch sales office of *Diamond Alkali Co.* was announced by *W. H. McConnell*, vice-president sales.

Mr. Wilkerson succeeds *John W. Kennady*, who last week was made

WE ADMIT
OUR FINISH WILL NOT
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YOU
BUT WE ARE SURE
TRUE BRITE
(BARREL)
NICKEL BRIGHTENER
CAN HELP YOU

- **BRIGHTER — Equal to best still tank quality**
- **BETTER DUCTILITY — No cracking or pealing**
- **SIMPLE TO USE — Temperature not critical and no carbon treatments necessary**
- **LOWER COSTS — 8 oz./100 gals. to start and 2 to 5 oz. addition/500 amp. hours**
- **NO RETURNABLE CONTAINERS — In 1 gal. jugs**

WRITE FOR TECHNICAL BULLETIN ON BARREL NICKEL PLATING

TRUE BRITE CHEMICAL PRODUCTS CO.
BOX 31A, OAKVILLE, CONN.
HANDLED BY LEADING DISTRIBUTORS

all your finishing needs

UNDER ONE ROOF

J. Holland & Sons offers you the most comprehensive operation in the entire finishing industry. Because we maintain one of the world's largest in-stock supplies of polishing, plating and spray equipment; we can deliver *in-stock merchandise immediately upon your request.*

You can forget about the problems of buying your requirements from numerous sources. Get dependability, complete satisfaction and "one-stop" buying from under our large roof!

Our engineering and technical staff is ready to assist you in solving special problems. We'll be glad to help!

J. HOLLAND & SONS, INC.
leaders in finishing equipment for over half a century
475 KEAP ST. (corner Union Ave.) BROOKLYN 11, N. Y.

general manager of the Diamond Black Leaf Co., Richmond, Va.

Mr. Wilkerson comes to his new post from Memphis, Tenn., where he has been a member of the sales staff since June, 1948.

A native of Tennessee, born in Lenoir City, Mr. Wilkerson graduated from the University of Tennessee, Knoxville, with a B.S. degree in business administration majoring in industrial engineering.

A World War II veteran, he saw service in the European theater with the U. S. Army Corps of Engineers.

Tamms Industries Expands Raw Materials Service

The Raw Materials Division of *Tamms Industries, Inc.* of Chicago has recently appointed new representatives in the following areas:

Robert Chenoweth, 531 Esperson Bldg., Houston 2, Tex.

Victor Roberson Co., 4515 Olive St., St. Louis 8, Mo.

Russell & Palmer Co., P. O. Box 2674 Custom House Station, New Orleans, La.

Robert F. Sheahan Co., Suite 728, M & M Bldg., Memphis 2, Tenn.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Plans Complete for June AES Show and Convention

Leon Westbrook

FOR the past twelve months, 98 committee members have been at work planning the *1955 Industrial Finishing Exposition* and *42nd Annual Convention* of the *American Electroplaters' Society*, June 20 to 23 inclusive at the Cleveland Public Auditorium. These Clevelanders have banded together to create one of the most outstanding convention programs ever staged by the AES. The Educational Session will offer some 40 technical papers covering every phase of industrial finishing.

Arrangements for the registration and housing of the 12,000 production and engineering executives who will attend the Exposition and Convention have been made by the registration committee. Housing is being handled through the Housing Bureau, 511 Terminal Tower, Cleveland, Ohio. Blocks of rooms in the major hotels have been set aside to accommodate the attendees.

The exposition promises to be one of the most interesting shows ever held by the American Electroplaters. According to *Leon Westbrook*, Chairman, Exposition Committee, more space has been sold than in any previous society show. Mr. Westbrook advises that exhibitors are planning to ship huge machinery into the exposi-

★ BUFFING NU SPRA GLU
Liquid buffing compound
since 1945

★ NUGLU
Cold flexible glue
since 1937

★ BRUSHING NUGLU
Grain and Nuglu mixture
since 1941

★ SPRAY BUFFING EQUIPMENT
Guns, pumps, and valves
since 1945

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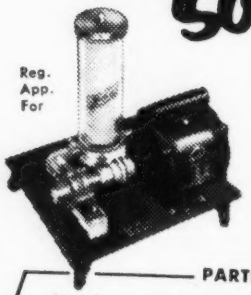
Filter your solutions!



Reg. App. For

50-2400 GAL/HR.
Self-priming Model LSIN-10 . . . Cap. 100 gal/hr. H.T. Lucite Filter Assembly. Stainless pump . . . totally enclosed Motor . . . portable . . . Wt. 60 lbs. . . . 14"x16"x16" high.
Distributors in principal cities.
Write for literature.

PARTIAL LIST OF MODELS

Model	Rated Capacity	Overall Size	Weight
LSI-5	50 gal/hr	11"x14"x12"	30 lbs.
LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
ASI-300	300 gal/hr	2'x2'x2'	125 lbs.
ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
RLS-1200	1800 gal/hr	2'x3'x3'	300 lbs.

SERVICE . . . Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.
DESIGN . . . **Filter Assembly** fabricated of stainless steel 316, high temperature lucite, rubber-lined, Haveg or Sethrin* resin. **Filter Tubes** of cotton dynel, porous stone or porous carbon. **Pumps** fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self-priming. **Motors** drip-proof, totally enclosed, or explosion proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. **Hose** — special acid and alkali resistant. **Base** — Linen Phenolic laminate on rubber tire ball bearing casters.

Sethco MANUFACTURING COMPANY
74 Willoughby Street • Brooklyn 1, New York

tion halls of Cleveland Public Auditorium. The machinery to be exhibited will transform the Public Auditorium into the world's largest finishing plant for the duration of the show. One firm will exhibit a plating unit 44 feet long, 12 feet wide, and 10 feet high.

Among the many products to be exhibited are: — Buffing and polishing compounds and machines, coatings of various kinds, tumbling barrels, heat exchangers, filters, pumps, rust proofing material, degreasing equipment, metal cleaning compounds, racks, thickness gages, rectifiers, motor generators, automatic and semi-automatic plating machines, tanks and linings, and hundreds of other products.

Going all out to make this the biggest and best exposition ever, the show will display an operating model of radar equipment. Various items of industrial finishing plants used on this radar installation will be graphically portrayed.

The Exhibit hours are:—

Monday, June 20	10:00 a.m.- 6:00 p.m.
Tuesday, June 21	12:00 p.m.-10:00 p.m.
Wednesday, June 22	9:30 a.m.- 6:00 p.m.
Thursday, June 23	9:30 a.m.- 4:00 p.m.

On Wednesday afternoon no educational sessions will be held. This will allow the entire afternoon for members and guests to visit the exhibits.

Social Functions Important:—Social functions have been scheduled so that everyone will have an opportunity to attend without interference with the educational sessions and exposition. On Sunday evening, June 19 at 8:30 p.m., the AES "*Get Together Party*" will be held in the Ball Room, Hotel Statler; Monday evening at 9:00 p.m., The *Metal Finishing Suppliers' Association* will hold their *Open House* in the Rainbow Room of the Hotel Carter. *Thomas A. Trumbour, Manson Glover, A. P. Munning,* and *Dr. M. M. Beckwith* are in charge of MFSA arrangements. Tuesday at 9:00 a.m. the Metal Finishing Suppliers' Association will hold a *Brunch* in the Ball Room of the Hotel Hollenden, which will be followed by their annual meeting. The Athletics Committee has scheduled the annual East-West Ball Game for 9:30 a.m. Tuesday morning. In the afternoon the *Annual Golf Tournament* will be sponsored by the Metal Finishing Suppliers' Association at the Sleepy Hollow Country Club, under chairmanship of *J. J. Duffy*. Arrangements have been made for golf for a limited number of guests at four private clubs for Sunday, June 19 and Monday, June 20. The clubs are Chagrin Valley Country Club, Lakewood Country Club, Manakiki Golf Club and Sleepy Hollow Golf Club.

Wednesday evening, June 22 at 9:00 p.m. the AES Floor Show and Dance will be held in the Ball Room, Hotel Statler. Thursday evening, June 23rd, at 7:00 p.m. the *Annual Banquet* will be held in the Rainbow Room, Hotel Carter.

The recently organized Ladies Auxiliary of the Cleveland Branch under the supervision of the President, *Mrs. Frances Hoffman*, has planned a fascinating program designed to interest the ladies who will accompany the members and guests. The events have been built around a theme of "*Living in Cleveland*." On Monday, June 20, at 12 noon, the ladies will visit the *Alpine Village* for luncheon and entertainment. The Alpine Village is Cleveland's outstanding supper club. On Tuesday, at 12 noon, the *Aunt Ella Luncheon* with Style Show will

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be held in Higbee's Department Store. This luncheon will be sponsored by *Oakite Products, Incorporated*, and the host will be *Dave Clarin*.

Wednesday, June 22 at 9:00 a.m., a tour will be made in a fleet of buses to the Westgate Shopping Center where the merchants have arranged special sales and events for the AES ladies. Following this, the ladies will be taken to the Lake Shore Hotel where a luncheon, sponsored by the *Udylite Corporation*, will be held. Host at the luncheon will be *Dr. R. B. Saltonstall*. Thursday morning, at 10:00 a.m., the *Plato Party* will be held in the Hotel Cleveland. *Joan T. Wiarda* of METAL FINISHING Magazine will be in charge of the distribution of the many prizes purchased by the Ladies Committee for this affair.

At 12:30 p.m. Thursday, the Ladies Auxiliary will attend a luncheon in the Hotel Cleveland. *Dorothy Fuldheim*, noted news analyst, will be the featured speaker. Other officers of the Ladies Auxiliary are:—Vice-President, *Mrs. George Shepard;* Recording Secretary, *Mrs. William King;* Treasurer, *Mrs. Robert Platt;* and Corresponding Secretary, *Mrs. Theodore Pavlish*. In addition to these events, the ladies will also attend the various social activities to be held in the evening.

According to *E. L. Combs*, Chairman of the Convention Committee, the following papers will be presented at the indicated sessions:—

Monday Afternoon 2:00 P.M.

First Session

Factors Affecting the Wear Life of Cloth Buffs
By E. T. Candee

The Anodic Etch in Preparation for Plating
By V. L. McEnally, Jr. and Fred G. Brune

The Plating of Beryllium Copper
By S. J. Morana

Metal Cleaning Evaluations Using Tagged Soils
By J. Hensley

Tuesday Morning 9:00 A.M.

Second Session *(dual)*

Session A

A Study of Hydrogen Embrittlement in Regards to Electroplating
By Carl Biser

A. Sound and Color Movie
B. Paper on Hydrogen Embrittlement

Abrasive Blasting as a Metal Finishing Tool
By C. Forestek and G. Kaufman

Electroless Nickel Plating of Non-Conductors
By Philip H. Eisenberg and Harold C. Schneider

Session B

Tin and Tin Alloy Plating
By Robert T. Gore

Vacuum Metallizing of Metal Parts
By J. Gordon Seiter

The Effect of Different Chromium Deposits on the Fatique Strength of Hardened Steel
By J. E. Stareck, E. J. Seby and A. C. Tulumello

Practical Methods for Treatment of Metal Finishing Wastes
By J. C. Hesler

Tuesday Afternoon 2:00 P.M.

Third Session

Electrotinning of Copper Wire From the Stannous Fluoborate Bath
By A. E. Carlson

Lead-Tin-Antimony Alloy Plating
By R. T. Putnam and E. J. Roser

Diffused Nickel-Cadmium as a Corrosion Preventive Plate for Jet Engine Parts
By R. W. Moeller and W. A. Snell

The Application of Ultrasonics to Various Plating Systems
By Stanley R. Rich

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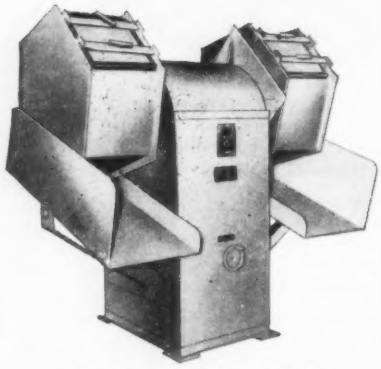

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Wednesday Morning 9:00 A.M.

Fourth Session *(dual)*

Session A

Some Aspects of Solution Level Controls
By John W. Holland

Recovery of Plating Wastes
By Louis Weisberg and E. J. Quinlan

Filtering Chrome Plating Solutions
By R. F. Ledford and L. Gilbert

Comparison of Selenium Rectifiers to Germanium Rectifiers
By J. F. Beall

Session B

The Theory and Practice of Airless Spray Painting
By James Bede

The Flow Coating of Organic Finishes
By E. A. Zahn

Qualities, Processing, and Future of Porcelain Enamel and Ceramic Coatings
By E. E. Bryant

Electrophoretic Deposition of Metallic and Composite Coatings
By J. J. Shyne, H. N. Barr, W. D. Fletcher and H. G. Scheible

Thursday Morning 9:00 A.M.

Fifth Session

Copper Anode Corrosion in Cyanide and Acid Copper Plating Baths
By W. H. Safranek and C. L. Faust

Methods of Conducting Classes for Electroplaters
By Ezra A. Blount

Accelerated Corrosion
By W. L. Pinner

Report from AES Research Committee
By Earl J. Serfass

Chicago Branch

In addition to reporting news of their regular monthly meeting, March 11, 1955, at the Western Society of Engineers, Chicago Branch points with pride to the increasing interest in and response to a recently initiated program. Just prior to presentation of their guest speaker, a three-man panel of experts presides at a short question and answer session. Panel members and the subjects on which they will be prepared to answer questions are listed in the regular monthly meeting notice and members are invited to submit questions to be answered at the meeting.

Panel members and their subjects of discussion for the March meeting were:

Marvin Daniel, Hotpoint Electric Co.,—Nickel-Chromium Finishes for appliances, and coating.

James Valone. Frederick Gumm Chemical Co.,—General Finishing and Cleaning.

Jerome Kuderna, Scientific Control Labs., — Plating on Aluminum and General Finishing Info.

After the question period, *Myron Ceresa*, presented "Some Practical Aspects of P. R. Copper Plating." Mr. Ceresa, a graduate of Pennsylvania State University (with a B.S. degree in Electrochemical Engineering), through this various activities in the Research Department, the Materials Engineering Department and in his present capacity as Manager of the Electroplating Projects Department at Westinghouse, is very well grounded in both the theory and practices involved in P. R. plating. As a result the members found his discussion very informative and of immediate help in some of their problems.

Members are looking forward with considerable expectation to their annual "Social Night," Friday, April 1, at Algauer's Fireside Restaurant in Chicago. There, after a shorty cere-

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mony for the installation of the new officers of the branch, they will spend the balance of the evening entertaining their ladies and enjoying an evening of entertainment provided by the branch. The candidates to be installed were elected by "closed ballot" at the March meeting. The slate presented by the nominating committee were:

President: *S. P. Gary, Jr.*
1st Vice-Pres.: *Ralph Pettit.*
2nd Vice-Pres.: *Charles McComb, James H. Connelly.*
Librarian: *Russell Harr.*
Secretary-Treas.: *Paul Glab.*
Board of Managers: *Ed Stanek*—Chairman, *Charles Silhavy* and *Harold Bielenberg.*
Delegates: *Clyde Kelly, Paul Glab* and *J. H. Monaweck.*
Alternates: *Ovid Bedard, Willard Carter* and *Matt Dassinger.*

Secretary Glab, reports that the work of compiling data for a new Chicago Branch Membership Directory is almost complete. He also reminds members and friends that copies of presentations by speakers before Chicago Branch are now available at a cost of $1.00 each.

Jerome Kuderna

Los Angeles Branch

New cross-connection rules and regulations of the Los Angeles Department of Water & Power as they apply to water supplies in plating shops were outlined at the March 9 meeting of Los Angeles Branch, A.E.S. by two department engineers.

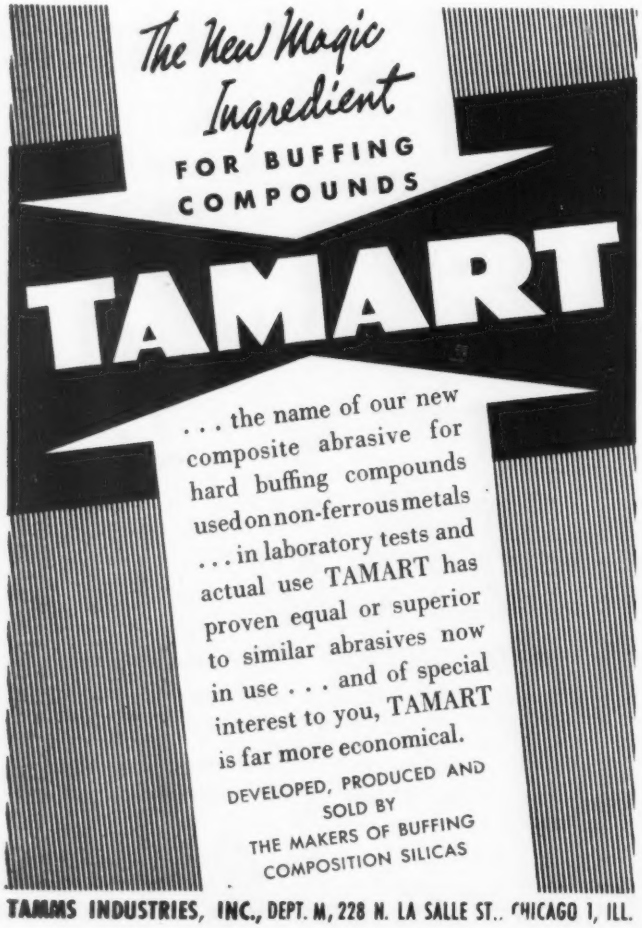
Harry Hayes, senior sanitary engineer, and *Roy O. Van Meter*, sanitary engineer, described the new Regulation No. 59 on cross-connections which was placed in effect on October 24, 1954, in Los Angeles as being, in its essentials, virtually an adoption for municipal application of the cross-connection regulations incorporated for statewide use in Chapter 5 of the California State Administrative Code.

The regulations, as they apply to plating shops and other industrial plants in which water pollution hazards are present within the jurisdiction of the Department of Water & Power, provide that no water service connection to any premises shall be installed or maintained by the department unless the water supply is protected against back-flow that might contaminate the potable water supply.

Hayes and Van Meter described the types of backflow preventive devices required under the regulations that must be approved by the department and installed at the expense of the shop owner. Under Regulation No. 59, Hayes and Van Meter declared, a back-flow prevention device must be installed at the service connection into the plating shop whether the water service is from a fire hydrant, temporary or regular or other connection.

The regulation also provides, the speakers explained, that only approved check valves may be installed. They defined an approved check valve as one that seats readily and completely. The municipal as well as state codes list eleven different types of premises that are required to guard against polluting back-flow by installing preventive devices. Numbered 4 and 5 on the list are: Plants where chemicals are manufactured and processed; and where a plating plant is operated and maintained. Violators are subject to no punitive measures other than having their water supply turned off.

Hayes and Van Meter submitted to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questioning from A.E.S. members, at the conclusion of their talks on miscellaneous other water problems as they affect plating shop operations.

The other speaker was *Earl Waynick* of the Horace Blackman Co., whose subject was "Latest Developments in Plastic Tank Lining Materials."

Branch President *G. Stuart Krentel* presided over the business session at which 85 members and guests were present. Among the guests was *B. C. Gardis* of Plating, Inc., Glendale, Cal., who was one of the charter members of the branch in 1929, but had dropped his membership and had not attended an A.E.S. meeting in 20 years. He promised *Don Bedwell*, also a charter member, that his signed application blank for reinstatement would be in the hands of Secretary *Norman K. McEwan* before the next meeting came around.

Pittsburgh Branch

The March meeting of the Pittsburgh Branch was held in the Avalon Room of the Sheraton Hotel following the usual dinner.

We were honored to welcome three new members into our branch: *John R. Drobne*, *Millard F. Good*, and *Paul W. Rhodes*.

Harry Flister reported the situation is well in hand for the Annual Ladies Night Banquet to be held in April. All arrangements have been completed and indications point to a most successful affair held to date by the branch.

President *Bob Varner* reported the status of the Pittsburgh Branch's bid to obtain the 1960 National Convention for Pittsburgh. Arrangements have been made in cooperation with the Pittsburgh Convention Bureau to obtain committments from the hotels for sufficient air-conditioned rooms to handle everybody. The branch is going all out to make arrangements for every phase of the convention at this early date.

Bob Woojter reported the Executive Committee's recommendation for an Honorary Membership for *Leo J. Schmitt* in the Pittsburgh Branch. Leo has many years of service as one of the most active and hard-working members of the branch. He was one of the earliest members and worked hard towards building the branch to its present status. We are all well aware of Leo's contributions to the branch and its members, and the decision was unanimous to bestow honorary membership on him as a token of our esteem.

Election of officers for 1955-56 was then held. The officers for next year are as follows:

President—*Rudy Schindler.*
1st V. Pres.— *Myron Ceresa.*
2nd V. Pres.—*Fred Dixon.*
Secretary—*Herb Schram.*
Treasurer—*Bill Pizoli.*
Librarian—*Jim Crain.*
Delegates — *Bob Varner, Rudy Schindler, Myron Ceresa.*
Alternate Delegates—*Ed Smith, Rex Goldbach, Bob Woojter.*

At the conclusion of the business session Bob Varner turned the meeting over to Librarian *Fred Dixon* to introduce *Paul Schaffner* of the Schaffner Mfg. Co., the speaker for the evening. Paul's talk was both very interesting and different from the usual type of subject. He discussed the composition, manufacture, testing and use of polishing and buffing compounds. Covering the different types of lubri-

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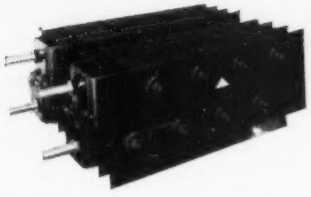

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cants used in the binders and the types and purpose for the various abrasives used, he was able to explain the necessity for the number of operations required before bright plating is possible.

During a brief pause for refreshments, guests were introduced, but *Bill Hennessy* of the Philadelphia Branch was not allowed to introduce himself since he attends so many Pittsburgh meetings. Also, at this time Bob Schaffner drew the name for the monthly door prize. *Mike Vucich* of Weirton Steel, a bachelor, was the fortunate winner of a Sunbeam Electric Frypan presented by Schaffner.

After a very interesting discussion period by the platers on the problems encountered with buffing compounds, the meeting adjourned.

Herb Schram,
Secretary

Central Michigan Branch

The March meeting of the Central Michigan Branch was held at the Meadow Lark Inn, Jackson.

The G. L. Nankervis Co. sponsored the meeting and *Earl Stidell* of this organization introduced the speaker of the evening, *H. Geduld* of R. O. Hull and Co.

Mr. Geduld took as his subject practical problems in bright zinc plating. The speaker outlined a step by step simple program for platers to follow in checking zinc plating operations when unable to obtain bright deposits. Mr. Geduld also furnished a written outline for a simple analytical method for zinc plating baths.

A film entitled Echoes in War and Peace was shown. This film was produced by the Bell Telephone Co.

Following the program a board of directors meeting was held and plans were made to again furnish an exhibit at the National Convention in Cleveland this summer. *R. L. Carter* and *R. W. Boos* were appointed delegate and alternate respectively.

R. W. Boos,
Publicity

Twin City Branch

The March meeting of the Twin City Branch was held in Minneapolis with *Ross Van Galder* of the Behr-Manning Co. as the guest speaker. Mr. Van Galder presented two movies which described the manufacture of abrasive cloths and belts and their utilization in industry. An open forum was held following the movies at which time he answered questions for the members. The branch was honored by the attendance of *Clyde Kelly* of the American Plating Co. who is 1st vice-president of the National Society. Mr. Kelly gave a short speech on the activities and functions of the national organization.

Other guests present included *Fred Johnson* of the Jos. Walkerstorfer Co., *Loring Lister* of the R. C. Duncan Co., *Bill Forbes* of the W. D. Forbes Co., and *John Mitchell* of the Pako Corp.

Bob Teply,
Publicity Co-Chairman

Grand Rapids Branch

The March 11, 1955, monthly dinner meeting of the Grand Rapids Branch was attended by approximately sixty members. President *Carl Green* opened the meeting by introducing *Henriette Fikse* the only lady present. Secretary *John Dykstra* read the minutes of the previous meeting. President Green read a letter from National Secretary *A. Doria* who complimented the Grand Rapids Branch for its paper awards program.

The following were appointed delegates to the National Convention: *Perry Burnham*, *Richard Watson*, *Donald Schantz*. Alternates were: *Rex McKercher*, *Steve Cowdery* and *Tony Preston*. A nominating committee consisting of *Lyman Sperry*, *Perry Burnham* and *Richard Watson* selected the following slate of officers for the coming year:

President—*Perry Burnham*.
1st Vice-President—*Bob Blackford*.
2nd Vice-President—*Tom Henner*.
Secretary—*Don Smith*.
Treasurer—*Pat Norton*.
Librarian—*John Dykstra*.
Assistant Librarian—*Paul Waalkes*.
1 yr.—Board of Managers—*Lyman Sperry*.

The above slate was unanimously accepted as the new officers for the coming year.

President Green was happy to announce the receiving of eleven new applicants. They were as follows: *Henriette Fikse* and *John VanderWarf* of the Jervis Corp., *Robert N. Lewis* of Grand Rapids Metalcraft Corp., *James L. Skar* of A.M.I. Inc., *John E. Gierre* from Udylite Corp., *John E. Hammer* of Haviland Products Co., *Ronald Dow* from United Chromium Inc., *R. J. Rosenback* of P. B. Gast & Sons Co., *John Peterson* from Diversey Corp., *R. L. Ballou* and *W. L. Jolitz* of the Rudy Mfg. Co., Dowagiac, Mich. All applicants were promptly accepted as new members. This brings the membership to an all new high quota.

In the absence of librarian *Tom Henner*, Mr. Burnham introduced the speaker for the evening, *A. R. Burman* who spoke on "Pressure Blasting as a New Tool for Metal Finishing." Mr. Burman cited the controlling variables in blasting (1) degree of agitation of abrasive slurry, (2) type and size of abrasive used, (3) abrasive to water proportion, (4) distance of gun from parts, (5) angle of gun to work pieces, and (6) amount and pressure of air used. Mr. Burman stated that many

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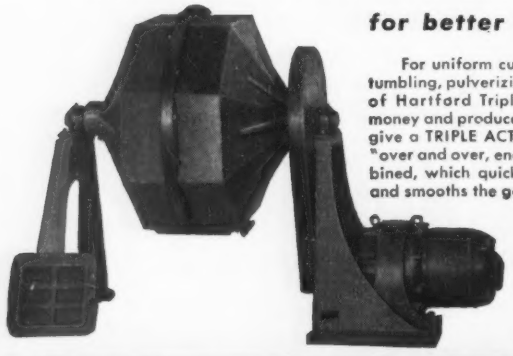

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heat treated parts cannot be cleaned any other way than by blasting. Blasting usually only removes approximately .0001" of metal surface. Blasted parts contain no hydrogen embrittlement. The process is very useful on cleaning up dies.

The excellent program concluded with the usual refreshments.

Kenneth Hampel,
Publicity Chairman

Louisville Branch

The regular monthly meeting of the Louisville Branch was held Thursday, February 17, 1955, at Kapfhammer's Party House, 1506 South Shelby St., with a dinner served at 6:30 P.M. President *J. W. Scholl* opened the business and open meeting at 8:00 P.M., with twenty-six members and guests present.

Elected to membership were: *James R. Smith*, 4703 Cliff Ave.; *Harold G. Peters*, 2918 Breckenridge Lane.

Bill Young, of the Cincinnati Branch A.E.S., gave a report of the Annual Tri-State Regional Meeting to be held on Saturday, March 26, 1955, at the Hotel Deshler Hilton, in Columbus, Ohio. *A. A. Oertel* moved and seconded by *S. J. Beyer* that the Branch go on record to participate in this program.

President Scholl appointed Mr. Oertel to a one year term, and *Richard G. Marshall* to a two year term, as delegates to the Tri-State Regional Meeting Committee. He also appointed the following to the nominating committee:

S. J. Beyer—Chairman
P. H. Pate
W. W. Francis
J. W. Scholl

A motion was made by Mr. Oertel and passed that a new membership roster be made. The president appointed *J. G. Sterling* and *S. J. Beyer* to make up this roster. The meeting was then turned over to Education Chairman Beyer who, after a brief talk, introduced *R. O. Hull*, president of the R. O. Hull Co., Rocky River, Ohio, who spoke on "Methods of Testing," which includes methods of testing rectifiers, electroplates and Hull cell testing of plating solutions. Slides were shown and narrated by Mr. Hull. Considerable discussion followed and Mr. Hull was given a rising vote of thanks for a very interesting talk. A General Electric film "A Is For Atom" was shown.

Refreshments were served, courtesy of *Marvin Steuernagel*, of the Ardco Co., Inc., Chicago, Ill., and the meeting adjourned at 11:00 P.M.

J. G. Sterling,
Sect'y.-Treas.

Waterbury Branch

On February 10, 1955, *Dr. Fred Lowenheim* of Metal and Thermit Corp. gave an excellent talk on "Tin Alloy Plating" to the Waterbury Branch. A lively discussion followed.

The March meeting was held in the Colonial Room of the Hotel Elton on March 10, 1955. *Dr. George Dubpernell* gave a complete review of the "Electroplating Handbook" by A. K. Graham. Following a movie on the "New York Giants — Highlights of 1954," *John A. Swift*, president, Swift Chemical Co., Canton, Conn. gave a fine talk entitled "Steel Compositions and Heat Treatments of Interest to the Plater." *Domenic Menchio* served as technical chairman.

W. P. Innes,
Publicity Director

Newark Branch

Ladies' Night and Past Presidents' Night was held on March 18th with about 85 in attendance.

A brief business meeting followed the presentation of a colored travel film of the West by *Howard Cobb*, during which *Joseph Azzolino, John Fiorita, Edward Herzig, Raymond Litterio* and *Salvatore Mollica* were elected to membership and applications were received from *Daniel Marino* and *James J. Shyne*. Fifteen members were suspended for non-payment of dues.

Supreme Society Past President *Franklyn J. MacStoker* then presented Branch Past Presidents' pins to those in attendance who had served the branch in this capacity, beginning with the fourth president *Edward Faint* (1917), and including *Royal Clark, Roy Stout, George Reuter, Paul Oldam, Samuel Taylor, William Bruhns, Howard Cobb, Zachary Irenas, Edwin Bowerman, Myron Diggin, Frank England, Robert Ehrhardt* and *Robert Horrocks*. A moment of silence was observed for the eleven deceased past presidents of the branch.

It should be noted that Mr. MacStoker's bodyguard across the Hudson into New Jersey territory included Messrs. *Amatore, Nadel, Fusco* and *Clarin* of the New York Branch.

The nominating committee, *Robert Horrocks*, Chairman, *L. Donroe* and *F. England*, submitted the following list of candidates:

President, *Thomas Austin.*
First Vice-President, *Clifford Struyk.*
Second Vice-President, *William Grigat.*
Secretary, *D. Gardner Foulke.*
Treasurer, *George Wagner.*
Librarian, *Gustav Bittrich.*
Sergeant-at-Arms, *Dodd Carr.*
Board of Managers: *Robert Ehrhardt, Robert Horrocks, John Gumm, George Reuter.*
Delegates: *Louis Donroe, John Gumm, D. Gardner Foulke.*
Alternate Delegates: *George Wagner, Myron Diggin, Robert Ehrhardt.*

No further nominations being received from the floor, it was moved and passed that the nominations be

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closed and the Secretary cast a ballot for the nominees who were then installed by Mr. MacStoker. Outgoing President John Gumm was presented a past presidents' pin and incoming President Tom Austin, after calling for an adjournment of the business meeting, turned the meeting over to Cliff Struyk and Gustav Bittrich who directed an exciting game of Bingo. Prizes were provided by *John Banta* of Oakite Products, Inc., *Cliff Struyk* of of General Chemical Co., *George Reuter* of J. Wiss & Sons Co., *Walter Prine* of International Nickel Co., *George Wagner* (absent in sunny Florida) of Hy-Grade Plating Co., *John Gumm* of Frederick B. Gumm Chem. Co. and *Don Foulke* of Hanson-Van Winkle-Munning Co., and won by *Mrs. D. G. Foulke*, *Mrs. Fred Meyer* (twice), *C. La Manna*, *Sam Taylor*, *Mrs. Robert Horrocks* (twice), *Ed Bowerman* and the grand prize—a clock radio—went to *William Jancik*.

Refreshments followed with the meeting finally breaking up at eleven.

D. Gardner Foulke,
Secretary

Capitol District Branch

Paul D. Callahan was elected president of the Capitol District Branch, *American Electroplaters' Society*, during a recent meeting of that group.

Mr. Callahan was born in 1920 in Saratoga Springs, N. Y. He attended public schools there, graduating in June, 1937, and received the "Yaddo Medal" for character and scholarship from Saratoga Springs High School. He entered Union College in 1938, and graduated in 1942 with the degree

Paul D. Callahan

of A. B. in Science, chemistry major.

Mr. Callahan was first employed by General Electric in 1941. After spending two years in the Army of the United States, he was discharged, and returned to General Electric. He joined the staff of the Materials and Processes Laboratory in 1947, where he is now employed.

Callahan married the former Jane Weglowski, and has one daughter, Kathleen Anne, age 13.

He has been secretary of the Capitol District Branch since its conception in February, 1954.

Detroit Branch

The March 4, 1955 meeting of the Detroit Branch was held in the Wayne Room of the Hotel Statler.

Joe Gurski, president, opened the meeting at 8 P.M. He introduced the chairmen of the various committees and thanked them for the help they had given him during the year. *Bob Racine* introduced the new members.

Since this was the annual ladies night, Mr. Gurski welcomed the ladies and expressed his appreciation for the huge turnout. This was the largest crowd of the year with about 350 present. There were at least 150 ladies present and Mr. Gurski expressed a desire too see twice this number next year. The movie of the evening was a film on the Pan American Road Race of 1955.

Fred Olmstead introduced the speaker of the evening, *Dr. Richard Saltonstall* of the Udylite Corp. Dr. Saltonstall's topic was "Jewelry Plating." For the women in the audience Dr. Saltonstall explained briefly and in simple terms the process of electrodeposition of metals. Starting from the artist designs he traced the steps of the manufacturer through to the final plating operation.

Refreshments were served after the meeting and a wonderful time was had by all.

Patrick J. Driscoll,
Publicity

Los Angeles Branch

Discussions of electroless nickel, precious metal and aircraft plating featured the technical sessions at the 20th Annual Educational Session of Los Angeles Branch, A.E.S., at the Ambassador Hotel, Los Angeles, Calif., on March 19.

Supplementing those subjects, a comprehensive report was given on the present status of plating and polishing in European countries by a representative of one of America's leading manufacturers of plating chemicals and supplies.

The day's program was presented in the form of morning and afternoon technical sessions, a noon-day luncheon, and the annual dinner-dance in the evening. General Chairman *Larry O'Neil* reported an attendance of 180 at each of the technical sessions, 225 at the luncheon, and in excess of 600 at the ball, this latter figure setting a new attendance record.

At the technical session, *Dr. M. M. Beckwith* of the Harshaw Chemical Co., Cleveland, O., gave a running account of what he saw in post-war finishing developments during a recent trip to Europe. The plating situation on the continent and in England, he said, is

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vastly different today that it was eight or nine years ago, and the progress of recovery has been phenomenally fast in some countries and slower in others.

Dr. Beckwith reported that plating recovery has been considerably faster in Germany than in France and England, and Germany today has more modern plating facilities than other European countries. This is due largely, according to Dr. Beckwith, to the fact that German installations, in many cases, were completely destroyed during the war and their replacement with entirely new equipment was a matter of compulsion. France and England, on the other hand, suffered less damage to their plating plants and, for economic reasons, have continued to use pre-war plating machinery supplemented in some cases by new equipment.

W. J. Crehan, Kanigen Division, General American Transportation Corp., Chicago, Ill., addressed the Los Angeles group on "Deposition of Electroless Nickel."

This speaker traced the history of electroless nickel by explaining that it was sparked by his company in 1947 through investigation of means for lining caustic shipping tank cars. An appraisal had revealed, he said, that original work done by the Bureau of Standards showed promising possibilities and could be improved to make tank car plating commercially feasible. Four years passed, however, before it was felt that sufficient progress had been made in bath improvements and methods for handling them in production.

Mr. Crehan declared that, in the reduction of nickel ions from solution, hypophosphite occupies a unique position. It alone, he explained, seems to possess a reducing potential of the right amount to give a controllable reaction and also one that is autocatalytic. The reaction, he said, can be made to go very slowly and also very fast up to spontaneous decomposition of the bath.

Other speakers were: *S. G. Bart*, president, Sel-Rex Precious Metals, Inc., Belleville, N. J., who discussed "Special Applications of Electroplatin for Industry," in which he included reference to the electrodeposition of precious metals; and *William Castell* of Lockheed Aircraft Co., Burbank, Calif., who presented a talk on "Chemical Processing in the Aircraft Industry."

Educational Chairman *George Hetz* found himself faced with that situation which all men in his position fear—the withdrawal of a speaker at the last moment. When one of the scheduled speakers was forced to withdraw because of circumstances beyond his control, George worked like a Trojan to fill the gap, and persuaded Dr. Beckwith to fill the vacancy on the program. Dr. Beckwith, despite the short notice, came through with one of the finest technical talks the branch has heard.

Harold Smallman, west coast manager of Hanson-Van Winkle-Munning Co., presided as toastmaster at the noon-day luncheon which was held in the Ambassador Hotel's Cocoanut Grove.

Among distinguished guests introduced were: *Dr. Joseph S. Smatico*, head of the Department of Chemical Engineering, University of Southern California; *Ernest J. Hinterleitner*, one of the leading research consultants of the Atlantic Seaboard who recently succumbed to the lure of California and established himself in San Diego; and *Thomas Pressley* and *Ken Smith* of the Washington Standard Products Co., Seattle, Wash., both charter members of the newly established Seattle-Tacoma A.E.S. Branch.

The story telling contest saw *Carroll McLaren* of the Santa Ana Plating Works emerge as the winner for the third consecutive year. Second prize went to *Louis Reed* of Excello Plating Co., and third prize to *Paul Franke* of the Price-Pfister Co.'s plating department.

Others who stepped to the microphone to tell their favorite stories were O'Neil, *Mitchell Raskin*, *Rhys Ricky*, *Earl Coffin*, *Dr. M. M. Beckwith*, *Jim Sowell*, and *Glen Beckwith*.

Space does not permit publishing the prize winning stories in all their effective detail, but to those interested, a note dropped to this columnist will bring the stories by return mail—if he still remembers them.

The committeemen who did the bulk of the work in arranging the educational session and dinner dance were:

General chairman, *Lawrence D. O'Neil*; educational chairman, *George Hetz*; reservations, *Harvey Hunt* (chairman), *Kim Jung* and *George Bartle*; luncheon and reservations, *Warren Davis* (chairman), *Ronald Hoyt*; door prizes, *James Sowell* (chairman), *Francis O'Dell*, *L. Truman Stoner*, and *Philip Simon*; entertainment, *Dexter Halldin* (chairman) and *John D. Millhorn*; Favors, *Jack Beall*; publicity and printing, *Harold Wanamaker* (chairman) and *G. Stuart Krentel*.

Rochester Branch

The March meeting of the Rochester Branch AES was held at the 40 & 8 Club on March 21, 1955. Present were 32 members and guests. Plans for the coming Regional Meeting to be held

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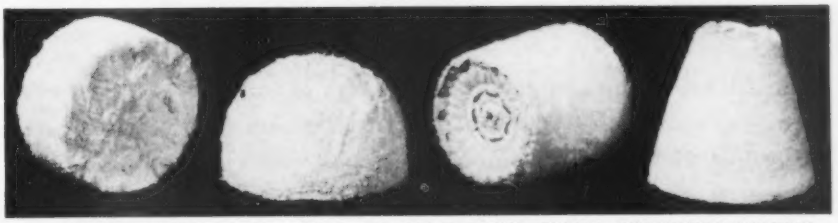

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on April 16th at the Hotel Seneca, Rochester, were discussed. Delegates and alternates to the forthcoming convention in Cleveland, Oho, June 20-23 were announced as follows:

Delegates: *William Tucker, Wellington Smith, Edwin Wallin.*

Alternates: *Frank Beuckman, Roswell Minard, John Hourihan.*

The business session was then adjourned and the meeting was turned over to Librarian *Frank Beuckman*, who introduced *Earl Reynolds*, chief metallurgist of Fasco Industries, who briefly and informatively spoke on Chemical Control of Zinc Phosphating Solutions. Mr. Beuckman then introduced *William K. Murray*, technical service engineer of Enthone, Inc. Mr. Murray gave a talk on "Stripping of Electrodeposits" which was well received by all members, especially those concerned with the many problems of stripping deposits. Mr. Murray also conducted a short question and answer period.

The meeting was then adjourned in favor of the usual refreshments.

Frederick L. Johnson,
Secretary

PLATING INSTITUTE OF MICHIGAN

William G. Crawford

The *Plating Institute of Michigan* has announced the election of its officers for the coming year.

William G. Crawford of the Peerless Chrome Co., Detroit, has been elected president.

William Savin of Harding Mfg. Co., Inc., is the new vice-president.

Bud Adelsperger of Auto City Plating Co. has been elected treasurer.

The members of the board of directors, in addition to the above officers, are *John Reilly* of Reilly Plating Co., *Glenn H. Friedt, Jr.* of United Platers, Inc., *Robert J. Huber* of Michigan Chrome and Chemical Co., and *Howard E. Morse, Jr.* of Northeastern Plating Co.

The Institute is a trade association whose members are engaged in the job-electroplating industry. The members are located in the Metropolitan Detroit area, Pontiac, Saginaw and Northern Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS

A wide range of subjects relating to research and testing of engineering materials will be discussed at the 58th annual meeting of the Society, to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-July 1, 1955. A total of 30 sessions are now scheduled beginning on Monday morning and continuing until Friday noon. Six symposiums are scheduled on the following subjects: impact, judgment factors in soils testing, significance of tests of concrete, high purity water

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corrosion, speed of testing, and metallic materials for service above 1600°F. In addition, sessions are scheduled at which individual papers will be given on the subjects of soils, non-ferrous metals, steel, testing of materials, and fatigue.

Important in the Society's activities are the large number of technical committee meetings which are scheduled. Forty-five committees and their subcommittees will hold a total of about 450 meetings.

On Wednesday evening, June 29, the annual dinner will provide a "break" in a week otherwise devoted to intensive technical activity. Entertainment will include a floor show and dancing.

SOCIETY OF DIE CASTING ENGINEERS

A new technical society, named the *Society of Die Casting Engineers*, has been formed to foster and further technological advances in the field of die casting and finishing of metals and die molding of plastics and powdered metals.

The main objective of the new society will be the exchange, accumulation and dissemination of the latest information and knowledge in the arts and sciences of die casting and related arts. A major aim is the development of modern standards for the die casting industry.

The first chapter to be formed within the new organization is the Detroit No. 1 Chapter. Officers of the new group for the calendar year 1955 are: president, *Harris Shimel* of Chevrolet-Bay City; vice-president, *Marshall Aberle* of H & M Industries; secretary, *George Griffenham* of Mergraf Oil Co.; recording secretary, *John Lapin* of Saginaw Bay Industries; treasurer, *Arthur Tinetti* of A. C. Spark Plug; librarian and historian, *Mike Tenenbaum* of Lester Phoenix Machine Co.; and trustees, *Harry Ericksen* of A. C. Spark Plug, *Herbert Roushkolb* of Cleveland Automatic Machine Co., and *John Miller* of H & M Industries.

Membership in the Society is open to those whose business activities relate to die casting, die molding, finishing and related arts. The new society's national headquarters and offices will be located at 19370 James Couzens Highway, Detroit 35, Mich.

News from California

By Fred A. Herr

Sunset Plating Co., 432 N. Varney St., Burbank, Cal., has completed installation of a new department for precious metal plating items for the electronics industry. Still tank and barrel plating facilities have been included in the new division.

The expansion program, involving a cost of $25,000, included conversion of the firm's original shop building into a precious metal plating department and also the installation of a new black oxide division for coating pipe and mill fixtures. The enlarged plant contains 7,000 square feet of floor area equipped to do hard chromium, anodizing, cadmium, silver, gold, passivating and magnesium treating. *Art Habits* is the owner. *Henry Saklad*

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shop foreman, and *A. C. Voyer*, assistant foreman.

Artcraft Plating & Finishing Co., 2532 Hollywood Way, Burbank, Cal., this spring completed installation work on a new department for plating of magnesium, with *William J. Wissman*, as department supervisor.

The new facilities round out one of the most completely equipped plating plants in Southern California. *Meyer Roter* and *James Barker*, owners, are set up to do hard anodizing, regular anodizing, electroforming in copper, nickel and silver, plating on plastic and non-metallics, and copper, chromium, cadmium, tin, zinc, rhodium, gold, silver, and nickel plating; black oxide finishes, baked enamel, chromating, caustic etching, water dip lacquer work and various surface treatments for aluminum alloys.

Roter and Barker like to refer to their plant as "The Biggest little shop in the country." Each department is set up to function under the individual control of its foreman, with its own expense and overhead structure. It has been found that this makes for healthy competition among department heads, who vie to have their divisions show a profit, without loss of cooperative integration with the company as a whole.

Joseph Swick is general manager. *Jack Abramson*, formerly in charge of all plating in the aircraft engine division, Ford Motor Co., Chicago, Ill., recently joined Artcraft as foreman of the chromium plating department.

Jack Raskin, of Los Angeles, manager of the plating division of the L. H. Butcher Co., conducted a plating clinic for the benefit of Mexico City plating shop operators at the El Prado Hotel in the Mexican capital recently, at which finishing men from the neighboring Republic were brought up-to-date on many technical matters pertaining to recent developments in the finishing field.

Raskin reported that 37 plating shop operators attended the conference to hear the discussion on plating and view films dealing with plating and ceramics. *Serge Fernandez* of the LHB Los Angeles staff served as interpreter, and *C. Torres McDonald*, superintendent of the General Electric Co.'s plant in Mexico City, as co-ordinator of the program.

The groundwork for establishing a Mexico City Branch of the *American Electroplaters' Society* was laid at the conferences when Raskin was requested to outline the aims and objectives of the AES. He pointed out that three Canadian and three Australian branches already lend an international flavor to the AES to which a proposed Mexico City Branch would give added distinction.

Arthur Pine, president, Mido Products, Torrance, Cal., has announced that his firm has been appointed Southern California representative for Mastercraft tumbling barrels, manufactured by F&M Sales of Hollywood.

R. C. H. Supply Co. is now occupying its modern new and enlarged quarters at 7031-33 Santa Fe Ave., Huntington Park, Cal.

Russel C. Hedeen, head of the firm, announced that his activities are now concentrated in a 75′ x 100′ main building equipped with display, sales

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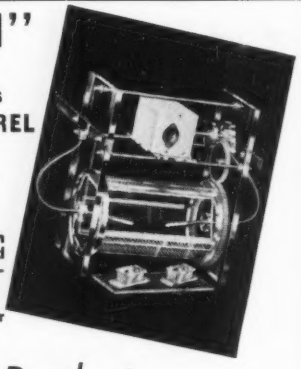

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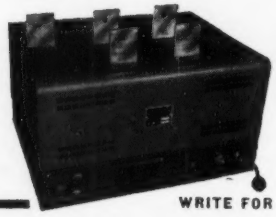

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and office facilities. There is also a 45′ x 45′ additional warehouse in which bulk lots of materials and chemicals are stored and prepared for distribution to the California metal finishing trade.

Hedeen started in the metal finishing industry with Minnesoto Mining & Mfg. Co. in 1934. In 1945 he went into business for himself in San Francisco as a distributor of metal finishing supplies and equipment; he moved his headquarters to Southern California in 1949. The present plant symbolizes the growth the enterprising firm has enjoyed during the past nine years.

The Chick Sales Plating Co. opened for business in mid-November, 1954, and less than five months later owner *Warren "Chick" Sales* reports that new equipment has to be installed to take care of the growing volume of work.

Sales started last November at 2515 Oris St., Compton, Cal., after devoting the previous 10½ years as plating superintendent for the Advance Plating Co. of Los Angeles. His shop is equipped to do cadmium and bright zinc plating, primarily on wire work, such as display racks, wire stands and baskets, etc.

He has just compleetd installing a 140 gallon barrel zinc unit to supplement a 225 gallon cadmium and 1,600 gallon zinc tank which were on hand when he purchased the equipment of the Morrel Electroplating Co. last fall. He has the 18 foot long zinc tank set up under a canvas top outside the plant. Sales operates under the catchy slogan—"We plate everything but the kitchen—Zinc."

Old-Timers of Los Angeles AES Branch experienced a nostalgic twinge recently when the name of *B. C. "Bernie" Gardis* of Plating, Inc., Glendale, Cal., was read off as an applicant for membership.

It represented Mr. Gardis' return to the fold after a lapse of 20 years during which he had not attended a meeting. He was one of that small group of charter members which founded the branch in 1929. Of that early pioneering group, the names of half

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a dozen or so are still on the membership rolls— *Clarence Thornton, Don Bedwell, Marcus Rynkofs, Frank Merigold, Earl Coffin, Ray Vasquez* and *Harold E. Coombs.*

Marcus Rynkofs of Liberty Plating Co., reports that work is nearing completion on a 32,000 square foot building at the rear of the plating plant, 5741 W. Jefferson Blvd., Los Angeles. The structure, costing $260,000, has been leased for 20 years to Olympic Plastics Co.

WESTERN METAL SHOW

WITH the technical sessions and show exhibits acutely geared to metal manufacturing, fabrication and finishing processes which primarily serve the needs of the Pacific Coast in the states west of the Rockies, the Ninth Western Metal Congress and Exposition, held March 28 to April 1 in Los Angeles, Calif., shattered all previous attendance records.

Manufacturers and distributors who displayed products directly applicable to the metal finishing field are listed below, together with a summary of products shown in the booths and the company personnel in attendance at Los Angeles:

Allison Co., Bridgeport, Conn., demonstrated Allison rubber bonded 20" wheels and Campbell #406 machine. On exhibit were snagging wheels for portable grinders, both straight and cup type. In attendance were *E. C. Scalon*, West Coast district manager, and sales engineers representing Tornquist Machinery Co., Los Angeles, and Hickerson Supply Co. of Los Angeles and San Francisco.

American Chemical Paint Co., Niles, Calif., exhibited a protective coating for titanium; aluminum corrosion protectors; acid pickling inhibitors; and phosphate coatings for paint bonding on steel. Manning the booth were *G. H. Williamson*, west coast manager; *C. R. Wishing*, Los Angeles sales engineer, and *T. P. Rogers*, sales representative, Niles, Calif.

Baron Industries, Los Angeles, Calif., exhibited airless spray equipment, reported as an entirely new process. Included in the exhibit were a degreaser, oven, and barrel degreaser, an economically priced vapor spray degreaser of compact design. Active at this booth were *William R. Hamilton, John T. Hogan* and *Frank H. MacQuarrie*, owners, Advertising Manager *Ernest Roehl*, and engineers *John Jukes* and *John McFarland.*

Bendix Aviation Corp., Pioneer-Central Division, Davenport, Iowa, displayed ultrasonic cleaners of 9" diameter and the new 21" diameter container — the first showing of the latter line. Also on display were magnetostrictive elements for use with water-detergent cleaning solutions.

Serving this booth were *R. W. Hancock*, sales manager; *L. L. Swartz*, exhibit manager of South Bend, Inc.; and engineers *G. Brown* and *Paul Gardner.*

G. S. Blakeslee & Co., Cicero, Ill., showed standard hand operated degreasers, degreaser solvent, and a scale model of a conveyorized degreasing machine. Present were *A. L. Bashe*, Cicero, sales manager; and Los Angeles sales engineers, *B. A. Stewart* and *Thomas D. Lendzion.*

Horace Blackman Co., Culver City, Calif., presented corrosion resistant coatings, rigid tank liners, and corrosion resistant pipe and fittings demonstrating applications of the firm's products. In attendance were *Horace Blackman*, president; *Terry Tamblyn*, vice-president; chief engineer, *John Bissell*, and sales engineers *Earl Waynick* and *George Beck.*

Chainveyor Corp., Los Angeles, Calif., presented a striking display which featured the firm's conveyor in movement under operating conditions. The light capacity, overhead continuous power conveyor for use in plating and organic finishing shops and other industry installations caught the eyes of show visitors by its continuous movement in the booth. Present to demonstrate the equipment were *Loren F. Working, P. J. Rauen, Arne Hilland, C. W. Long* and *W. L. Schilling* of the firm's Los Angeles staff.

Clementine, Ltd., San Francisco, Calif., displayed various items in the field of sandblast equipment including a remote control deadman valve, which serves as added safety for the sandblaster and a venturi style tungsten-carbide sandblast nozzle. Also exhibited were pressure tanks, abrasive cleaning cabinets, dust collectors, control valves and related accessories. *A. J. Cleary*, general manager, and *R. G. Baldisserie*, equipment sales supervisor, operated the booth.

Consolidated Vacuum Corp., (subsidiary of Consolidated Engineering Corp.) Rochester, N. Y., exhibited a 5 to 50 lb. high vacuum melting and casting furnace, several new thermocouple vacuum gauges, and KS-200 3-stage fractionating oil diffusion pumps. Present were *R. O. Johnson*, field manager; Palo Alto, Calif.; *William F. Dolke*, resident manager; and *A. H. Hartman*, sales manager and *Charles P. Holderbaom*, field manager, both of Rochester, N. Y.

Despatch Oven Co., Minneapolis, Minn., displayed a working model aluminum solution heat treating fur-

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nace. The staff in attendance was headed by *C. P. Doherty*, president; *Fred Larsen*, vice-president, and *F. S. Larsen*, sales manager of Minneapolis; plus representatives from the firm's Los Angeles, San Francisco and Portland, Ore., branches.

Detrex Corp., Detroit, Mich., exhibited a solvent vapor degreaser for low cost cleaning of miscellaneous parts in bulk and in baskets and requiring rotation for drainage. Also shown in this booth were an ultrasonic degreaser for cleaning of highly finished parts with close tolerances; a portable demonstrator with glass sides to observe cleaning with sound waves; and solvent vapor degreasing and chemical cleaning processes. Present were *W. F. Newberry*, director of sales; *A. W. Stoddard*, director of advertising; *D. E. Williard*, sales manager of the industrial division; chief engineer *T. J. Kearney; R. B. Carlisle*, Pacific region manager, and *G. A. Jacobs*, his assistant; and a number of Los Angeles representatives.

Diversey Corp., Chicago, Ill., displayed a reverse current cleaner; a heavy duty soak tank metal cleaner; a satin finish dip for aluminum; and a process for preparing aluminum for resistance welding. In attendance were *Myron T. Bennett*, manager, and *J. H. Palmer*, assistant manager, metallurgical department, from Chicago; *C. F. Wentworth*, Pacific division manager; and sales engineers, *R. E. Erickson, W. C. Thompson, E. B. Wiley* and *H. G. Spotts*.

Electro-Chem. Mfg. Co., Inc., exhibited hard chromium on aluminum and hard anodizing processes which are reported to give excellent wearing surface for bearing applications and corrosion resistant. Also exhibited were a variety of applications to show the possibilities of using light weight aluminum in place of steel.

Serving the booth were *Myron A. Miller*, general manager; *William J. Fullmer*, business manager; *Richard Golden*, sales manager; and *Art Walker*, sales representative.

Field Abrasive Mfg. Co. Inc., Dayton, O., demonstrated an economical and quick method with which tubes and cylinders can be polished. Also abrasive pads, a new concept for finishing forging dies, moulds, etc.; sanding discs and wheels with new back-up adaptor pads.

In attendance were *H. E. Cook*, sales manager; *H. J. Sherman*, vice-president; *Walker Lehman*, engineer, Dayto, O.; and *Daniel Deluquish*, Los Angeles sales engineer.

Adoph Frese Corp., Los Angeles, Calif., exhibited an electropolarizer for determining trace elements in plating baths or metal samples — copper, lead, cadmium, etc.

In attendance were *C. Frese*, president; *B. Frese*, secretary; *M. Baybrooks*, treasurer; *William J. Grover*, sales manager; and *B. Phelps*, purchasing agent.

Glo-Quartz Electric Heater Co., Inc., Willoughby, O., displayed translucent and transparent fused quartz immersion heaters; steel, stainless and copper immersion heaters; laboratory quartz "pencil" heaters; as well as thermostats and time switches. Present were *G. T. Strokes*, vice-president, sales; and *H. Richert*, sales engineer.

Harshaw Scientific Division of Harshaw Chemical Co., Los Angeles, Calif., displayed balances; a high frequency induction furnace for carbon and sulphur determinations; a rotating, vacuum evaporator; recording spectrophotometers and pH meters, plus miscellaneous other measuring and testing instruments.

L. N. Smith, general manager of Cleveland, O., and *J. H. Schering*, manager, were assisted at this booth by West Coast sales engineers, *J. Berry, R. F. McClure, S. Reynolds, E. Fraigun*, and *C. E. Schreck*, and chemists *W. Porter* and *G. Dumont*.

E. F. Houghton & Co., Philadelphia, Pa., sponsored a booth in which show visitors joined in a unique quenching quiz, with daily prizes offered for those who answered the question of the day. Another feature of this metal working exhibit were room temperature cleaners for still tanks on the production line to remove oil contaminants and ordinary factory dirt.

D. J. Richards, vice-president, sales; *James McElgin*, manager of the metal working department, and *D. C. Miner*, advertising manager, from Philadelphia headquarters, were assisted at this booth by Western Division Sales Manager *W. A. Fletcher*, and sales representatives from the Los Angeles, San Francisco and Seattle offices.

International Nickel Co., Inc., New York, exhibited metal items illustrating various uses of nickel and nickel alloys, and ductile iron castings. The booth was staffed by members of the Los Angeles organization, including *A. G. Zima, H. N. Farmer*, and *K. L. Clark*, and the following from New York: *W. Adamson, W. R. Ferguson, H. S. Lewis, D. W. Machon, C. R. Mayne, A. P. Moore, R. G. McCauley, R. E. Redell*, and *F. G. Sefing*.

Lake Chemical Co., Chicago, Ill., exhibited high heat coatings for protection of equipment against corrosion and scaling at high temperatures; paintsticks, etc. There were also visual demonstrations of soldering fluxes.

The Malayan Tin Bureau, Washington, D. C., exhibited Malayan tin ores and metal, and distributed printed information on tin products and ores. In attendance were *Lynn W. Meekins*, director; and *A. Blank Calder*, assistant director, both from Washington.

Merit Products, Inc., Culver City, Calif., presented displays which emphasized the advantages of their grinders, a flexible wheel designed to follow the contour of a piece being worked; and wheels for finishing any contour with no special setups.

Present were *A. Block*, general manager; *William Gillett*, works manager; *L. Hennek*, assistant works manager, all of Culver City, Calif.; and *M. M. Bernstein*, président, Beverly Hills, Calif.

Mido Products, Torrance, Calif., exhibited special cleaning compounds, barrel finishing compounds, and barrel finishing equipment. Technical information was distributed on the firm's

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complete line of products, including tumbling abrasives and tumbling barrels. In attendance were *Arthur Pine*, president; *Herman Ey*, sales manager; and *Marvin Kapp*, sales engineer.

Metallizing Co., Los Angeles, Calif. Equipment was set up in this booth to demonstrate how metallizing is used for building up shafts and worn machine parts so they can be ground-finished to standard size. Metallizing was also demonstrated as a corrosion-resistant coating to various types of tanks and equipment, and for decorative purposse to steel surfaces. Present were *Richard S. Jensen*, owner; *H. B. Rice*, sales manager.

Met-L-Check Co., Los Angeles, Calif., displayed treatments for magnesium; an ultrasonic device for finding defects in metals, glass, ceramics and plastics; and a visible penetrant method of finding defects in the foregoing materials. In attendance were *L. W. Sockman*, manager; *Wilbur Metzler*, sales manager; *Fred Bush*, *William Ferguson* and *John Amerling*, Los Angeles distributor; and *James Brennon*, San Francisco distributor.

Miller Machine Tool & Gauge Co., Glendale, Calif., exhibited precision barrel finishing units, described as a complete self-contained unit. Present were *Haskell Miller*, *Lloyd Healy*, *Harold Marcus*, and *May Miller*.

Norton Co., Worcester, Mass., displayed an action exhibit composed of a centerpiece, a rotating 5′ diamond wheel, flanked on either side by enlargement, one showing carbide grinding with a diamond wheel, the other showing jet rocket at take-off. Shown also was a panel of diamond wheels, reinforced resinoid wheels, carbide grinding wheels, and various cements and coatings for high corrosion resistance to hot gases. *E. R. Stevens*, abrasive grain engineer from Chicago, was in attendance with a large staff of sales engineers from the Los Angeles, San Francisco and Seattle branches.

Oakite Products, New York, exhibited the recently announced alkaline deruster designed primarily for the removal of rust and heat scale from parts where dimensional change and acid embrittlement must be avoided; also iron and zinc phosphate treatments, electrocleaning, barrel finishing and drawing compounds, and materials for paint spray booth water treatment. In attendance were *J. C. Leonard*, Southern Pacific Coast division manager; *S. E. Beal*, aviation division manager; *C. S. Rankin*, North Pacific Coast Division Manager; and a staff of sales representatives from Los Angeles, San Francisco and Seattle.

Ransohoff, Inc., Hamilton, O., showed a cabinet type automatic in operation for washing, rinsing and drying stainless steel, mild steel and aluminum machine parts. An operating scale plastic model showed the automatic separating and return media feature of the firm's deburring, burnishing and sawdust polishing barrels.

Sanford Processing Co., Los Angeles, exhibited jointly in a booth with the Far-Best Corp. of Los Angeles, samples of the latter company's products, samples of aluminum hard coating, and colored aluminum.

Spar-Tan Engineering Co., Los Angeles, featured the porous chromium and iron plating processes. In attendance were *Fred W. Gartner*, sales manager; *George J. Moeller*, general manager; and *Roger Moeller*, process engineer.

Spee-Flo Mfg. Corp., Houston, Tex., featured the newest addition to its line, an all electric hot spray heater, which provides completely automatic viscosity and temperature control of conventional paint materials. The firm's complete line of hot spray production heaters was on exhibit, with a special display of heaters for heavy viscosity materials.

In attendance were *Gustave S. Levey*, president; *S. F. Harvey* and *L. Crosswhite* of Houston; *J. C. McCord*, western regional manager, Los Angeles; *W. Lyman*, industrial district manager, Vancouver, B. C.; and *D. Zavitz*, Spokane, Wash.

Tin Research Institute, Inc., Columbus, O., displayed an automatic plating unit in operation to demonstrate the new bright tin-nickel alloy coating. Distributed were manuals designed to assist technical personnel in utilizing tin, tin alloys, tin coatings and tin compounds to best advantage. Present from Columbus were *R. J. Nekervis*, chief metallurgical engineer; *R. M. MacIntosh*, chief chemical engineer; *P. D. Davis*, development engineer; and from Toronto, Canada, *E. A. Lancaster*, development engineer.

Turco Products, Inc., Los Angeles: On display were metal parts formed and sculptured by a new process for precision forming of metal parts from aluminum sheet and forging stock by immersion in chemical solutions. Also shown were tapered sheets and extrusions that had been tapered by gradual immersion in or removed from etching solutions to a thickness as low as 0.002 inches. In attendance were *C. D. Divine*, public relations and advertising manager; *Harry Smith*, manager, Dry-Shek Division; District managers *George Scherer* and *Robert Streeton*; assistant district managers *James Swett*, *J. R. Foster*, and *H. R. Foster*.

United Chromium, Inc., New York, exhibited crack-free chromium plating which provides improved corrosion resistance. Samples of and information on various sprayable vinyl plastisol products that produce thick chemical-resisting coatings were available, along with data on rack coatings, protective coatings, conversion coatings for zinc and cadmium. The booth was serviced by *E. E. Collings*, Los Angeles district manager.

Wyandotte Chemicals Corp., Wyandotte, Mich., exhibited the firm's line of products for the aircraft, metal working and metal finishing industries. A special display showed recent findings in metal cleaning research through the use of radioactive tracers.

Present were *R. J. Racine*, manager of indstrial sales; *T. R. Todd*, district sales manager, and sales representatives from the Southern California and San Francisco districts.

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1—Chandeysson Electric 1000 ampere, 6 & 12 volt, Exciter in head, Synchronous motor.

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1—Production #101 tube polisher unit.

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6—500/6 volt Basic General Electric converted to selenium rectifiers.

10—Mallory Udylite 1500/6 & 12 with remote controls — Priced to sell.

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500/250	6/12	Optimus
635	55	Elec. Prod.
640	39	West.
750/375	6/12	Excel
940	32	Elec. Prod.
1000/500	6/12	H-V-W
1500	13	Columbia
1500	30/50	Century
1500	40/65	G. E.
1500	70	Century
2000/1000	6/12	H-V-W
2000/1000	6/12	Chandeysson
2500/1250	6/12	Elec. Prod.
3000/1500	6/12	Ideal

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CFM	Pres.	Make
1100	4½" S.P.	Bayler
2344	2" S.P.	Clarage
2500	½" S.P.	American
3420	8" S.P.	N. Y.
9000	6" S.P.	Northern

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1—5000/2500 Amp., 7/14 V., Chandeysson, 25° C., Exc.-in-head.
1—5000/2500 Amp., 6/12 V., Chandeysson, 25° C., Synch., Exc.-in-head.
1—4000/2000 Amp., 6/12 V., Chandeysson, 25° C., Exc.-in-head.
1—3000/1500 Ampere, 6/12 Volt, Columbia, Synchronous.
1—2500/1250 Amp., 8/16 V., Electric Prod., Synch., Exc.-in-head.
1—2000/1000 Ampere, 9/18 Volt, Electric Products.
1—1500/750 Amp., 6/12 V., H-VW-M, Synch., Exc.-in-head.
1—1500/750 Amp., 12/24 V., Chandeysson, Synch., Exc-in-head.
1—1000/500 Amp., 6/12 V., Electric Prod.

— ANODIZERS —

1—4000 Amp., 40 V., Chandeysson, Exc.-in-head.
1—1000 Amp., 40 V., Chandeysson, 25°C.
1—1000 Amp., 30 V., Ideal, Exc.-in-head.
1—750 Amp., 60 V., H-VW-M, Synch., Exc.-in-head.
1—500 Amp., 25 V., Chandeysson, Synch., Exc.-in-head.
1—400 Amp., 40 V., M. G. C., Exc.-in-head.

— RECTIFIERS —

1—2000/1000 Amp., 6/12 V. G. E. Copper Oxide & Control.
1—Green Selectoplater, 1800 Amp., 12 V., 220/3/60.
1—Udylite-Mallory, 1500/750 Amp., 6/12 V., Control.

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1— 800 A HVW 6/12 V.
1— 600 A Eager 6/12 V.
1— 500 A Chandey. 12 V.
1— 300 A Hobart 6 V.
1— 200 A Boissier 6 V.
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7—Packermatic Heads.
1—C-6 Porter Cable.
1—484 Production duplex machine.
2—15 H.P. Packermatic Heads, w/extra long shaft, heavy duty floating frame.
4—3 H.P. Acme Heads.
2—Acme B-10.
1—4 Spindle Semi-Automatic.
1—8 Spindle Semi-Automatic.

RECTIFIERS & GENERATORS

2—Rapid 6 v. 500 amp.
10—G. E. 6 v. 500 amp. w/selenium stacks.
1—Chandeysson 1000 amp. 40 volt Comp.
1—Hobart, outside excited 500 amp.
1—5000/2500 Amperes, 8/16 Volts, Bogue.
1—2000 Amp. 15 v. generator.
10—125 amp. 9.5 v. New Hobarts.
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Placo 750 amp. 9 v. New Rectifier.
Placo 750 amp. 6 v. New Rectifier.
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POLISHING LATHES

2—Divine 5 H.P.
2—U. S. Direct Drive 7½ H.P.
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1—Liquod equip., with slurry tank, rubber lined.

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1—Reliance 8" x 18".
1—Udylite, double 14" x 30".
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1—U. S. Chromium pltg. barrel.

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5—60" x 36" x 36" stainless steel, complete with overflows, ducts, and pipe connections.
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Over 100 other tanks, assorted sizes.

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1—7′ x 36" x 60" steam degreaser with duct.
1—Circo 4′ S.S. Clad Electric Degreaser.
1—4′ Detrex steam degreaser com. w/pump.
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3—Roto Cone Dust Collectors.
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